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# ASTRONAUTICS INFORMATION

## ENGINEERING EQUIPMENT AND PROCESSES ADAPTABLE TO LUNAR AND PLANETARY EXPLORATION

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LITERATURE SEARCH NO. 464

MAY 1963

JET PROPULSION LABORATORY  
CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA, CALIFORNIA

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## **ENGINEERING EQUIPMENT AND PROCESSES ADAPTABLE TO LUNAR AND PLANETARY EXPLORATION**

LITERATURE SEARCH NO. 464

COMPILED BY

DOROTHY I. SWEITZER

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CALIFORNIA INSTITUTE OF TECHNOLOGY  
PASADENA, CALIFORNIA**

MAY 1963

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National Aeronautics & Space Administration

## FOREWORD

Unmanned exploration will involve adaptive or remote control of mobile or stationary manipulators and instruments for observing, testing, and analyzing soil, vegetation, and atmosphere. Manned exploration will involve control of such equipment and construction of habitable bases above or below ground. Since environmental conditions may be adverse, the methods of handling materials are likely to be similar to those used for radioactive materials. The environment may or may not include liquids, atmospheric gases, and vegetation.

At the request of engineering and research personnel of the Jet Propulsion Laboratory (JPL), a number of informal literature searches were compiled concerning various types of equipment and processes which might be usable for or adaptable to extraterrestrial land-based exploration. References selected from these unpublished searches and additional references from the literature are presented in this form for the use of other agencies working in the field of aeronautics. The available literature was perused rather carefully up to the cutoff date of September 1962. A few later references of special interest are included.

The references were obtained from *Engineering Index (EI)*, *Applied Science and Technology Index*, *Readers' Guide*, *Nuclear Science Abstracts (NSA)*, *Aeronautics Information Abstracts (AI/A)*, *Aeronautics Information Survey (AI/S)*, Armed Services Technical Information Agency (ASTIA) *Technical Abstract Bulletins*, *Applied Mechanics Reviews (AMR)*, *Industrial Arts Index*, *Chemical Abstracts (CA)*, *Physics Abstracts (PA)*, *Monthly Catalog of United States Government Publications*, *Biological Abstracts (BA)*, *Psychological Abstracts (PsyA)*, *Bibliography of Agriculture*, Space Technology Laboratories' Literature Search "The Lunar Problem" (LP), National Aeronautics and Space Administration *Scientific and Technical Aerospace Reports* and *Technical Publications and Abstracts*, and miscellaneous periodicals and reference lists.

The sections of this literature search comprise references to manipulators; vehicles of various sorts; structures above and below ground; sampling and examination of materials; remote, automatic, and adaptive control; human factors in control; and general mechanisms and practices, a knowledge of which may be useful in planning manipulators and bases. Among the practices are mining, drilling, excavating, preparing terrain for construction, conveying, and hoisting. Although primary interest lies in the mechanical problems of exploration, some analytical and testing techniques have been included. The sections of this literature search overlap in subject matter. Each section may be considered as a sampling of its subject, although some sections comprise more comprehensive samplings than others. Many references are included without abstracts to provide a wider subject scope within the limits of one volume.

The compiler wishes to acknowledge the advice and assistance of Rudolph Rieder, Raymond McCreary, William Schimandle and Ivan Walenta in the selection of material.



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## GENERAL MANIPULATORS

### 1. SERVOS FOR REMOTE MANIPULATION

Goertz, R. C., Burnett, J. R., Bevilacqua, F.  
March 26, 1953

Argonne National Laboratory, Lemont, Ill.  
ANL-5022, W31-109-eng-38  
AD-9289

### 2. TEST OF MOUNT, CALIBER .50 MACHINE GUN, REMOTE CONTROLLED

Sheikh, R. U.  
1956

Aberdeen Proving Ground, Md.  
Final Report 1  
AD-116,550, Project TT2-725C

The mount is a self-contained unit controlled and operated from a remote position... The unit requires no electrical or other power supply from the vehicle, but is operated manually from a remote position by a hydraulic and mechanical system. Sighting is also done from a remote position. The mount has, in general, adequate performance characteristics. Response ratios, handwheel efforts, and laying time are found satisfactory. The transmission of hydraulic control fluid from stationary controls to rotating parts through a slip ring is satisfactory for this application... (ASTIA)

### 3. MANIPULATOR REDESIGNED FOR PRODUCTION

*Product Engineering*, v. 27, pp. 150-151, June 1956

### 4. STANDARD MANIPULATORS REDUCE WELDING EXPENSE

*Tool Engineer*, v. 36, p. 94, June 1956

### 5. MECHANICAL SLAVE PERFORMS AT MASTER'S BIDDING

*Electrical Engineering*, v. 75, p. 671, July 1956

### 6. GENERAL ELECTRIC POWER-OPERATED MANIPULATOR

*The Engineer*, v. 205, p. 443, March 21, 1958  
(See also excerpts in *Engineering*, v. 185, p. 397,  
March 28, 1958)

### 7. G.E.C. POWER-OPERATED MANIPULATOR

*Metallurgia*, v. 57, pp. 303-305, June 1958

### 8. SURVEY OF FORGING MANIPULATORS AND THEIR APPLICATIONS

Lillywhite, P. L.  
*Iron and Steel Institute, Journal of the*, v. 190,  
pp. 394-413, December 1958

### 9. MANIPULATING DEVICES

Britt, J.  
*Nuclear Engineering*, v. 4, p. 92, February 1959  
(Also available as British Patent 797,882, assigned to Rolls-Royce, Ltd., obtainable from U.S. Department of Commerce, Washington, D.C.)

The device is intended for handling articles by remote control, e.g., in a space containing liquid sodium at high temperature from which the mechanism must be protected, and which itself must not be contaminated by any lubricant or coolant. A rigid tubular casing with straight portions connected by a curved portion is provided with internal guide faces for a girder structure of a pair of flexible strips and interconnecting links. The strips are in sliding contact with the guide faces and by interlocking of the links and strips in one straight portion, a rigid structure is formed capable of supporting bending loads in the center-plane of the curved section of the casing. The interlocking and unlocking is effected by projecting the girder member more or less from the end of one straight portion. Suitable gripping means is carried at the operative end of the girder. The casing is made rotatable about an axis through one of its straight parts so as to be movable over a large area. (NSA, 1959, #8469)

### 10. HANDYMAN, SLAVE ARMS GETTING CLOSER TO HUMAN MOTIONS

*Product Engineering*, v. 30, pp. 21-22,  
March 30, 1959

### 11. ALMOST-HUMAN ENGINEERING

*Machine Design*, v. 31, pp. 22-26, April 30, 1959

12. FOUR PERMANENT-MAGNET DRIVES TRANS-  
MIT SEVEN MANIPULATOR MOTIONS  
*Machine Design*, v. 31, pp. 184-185, May 14, 1959

13. MANIPULATOR FEELS AND HEARS;  
DESIGNED FOR WORK ON ATOMIC  
AIRCRAFT MACHINERY  
*Electronics*, v. 32, pp. 102-105, May 29, 1959

14. REMOTE CONTROL MANIPULATOR  
Jelatis, D. G.  
June 24, 1959  
U.S. Department of Commerce, Washington, D.C.  
British Patent 815,515

A master-slave arm arrangement is described in detail.  
(NSA, 1959, #18,081)

15. REMOTE CONTROL MANIPULATOR  
Goertz, R. C., Schmitt, R. G., Jr., Olsen, R. A.  
June 24, 1959  
U.S. Department of Commerce, Washington, D.C.  
British Patent 815,516

Another master-slave arm arrangement is described in detail.  
(NSA, 1959, #18,082)

16. LABORATORY VACUUM MANIPULATOR  
Kanunov, M. A., Sokovishin, V. A.  
*Instruments and Experimental Techniques*, no. 4,  
pp. 650-653, July-August 1959 (Translated from  
*Pribory i Teknika Eksperimenta*)

A manipulator for evacuation and production of electric vacuum devices without exhaust tips and getter elements is described. The manipulator provides for the possibility of simultaneously evacuating and soldering (with low-melting solder) three devices in high vacuum.  
(EI, 1960)

17. STRIP IS MUSCLE FOR METAL HANDS  
Jelatis, D. G.  
*Steel*, v. 145, p. 165, October 19, 1959

18. APPLIED RESEARCH IN MICROMINIATURE  
FIELD EMISSION TUBES  
Hansen, W. W.  
October 1959  
Stanford Research Institute, Menlo Park, Calif.  
QPR 1 for July 1-October 1, 1959, SRI Project 2937,  
DA 36-039-sc-84526

Apparatus is being designed for the study of simulated tubes containing field emission cathodes. Principal components are a demountable ultra-vacuum chamber and a micro-manipulator to produce small displacements of tube elements in three dimensions.

19. MANIPULATOR CABLE WITH CONSTANT  
STRESS  
Grimson, J. H.  
November 1959  
Argonne National Laboratory, Lemont, Ill.  
ANL-6079, W-31-109-eng-38

A manipulator or mechanical arm involves an upper and a lower arm, with a variable angle between them. Cables used to transmit motion and force from the upper to the lower arms pass over a pulley at the joint or elbow. A pulley, axially fixed with respect to the joint, imposes a change in length of the cable as the angle between the arms varies. Manipulation design requires a cable of constant length during this variation; this constant length may be achieved by guiding the center of the pulley along the proper path. Acceptable solutions were obtained in terms of variables such as the length of each arm, the radius of the pulley, and the angle between the arms. In one design the pulley center is moved along a straight line with respect to the lower arm, while in the other solution the pulley center is moved along a circular arc with respect to the upper arm. Practical and economical mechanisms based on these solutions were investigated for use in manipulator design. (NSA, 1960, #6428)

20. MANIPULATOR: ITS DESIGN AND  
APPLICATION  
Somers, J. C.  
American Society of Mechanical Engineers,  
New York, N. Y.  
Paper 59-A-186, presented at ASME Meeting,  
Atlantic City, N.J., November 29-December 4, 1959  
(See also *Mechanical Engineering*, v. 82, pp. 64-65,  
February 1960; v. 82, p. 90, August 1960)

A manipulator is a piece of equipment used to lift or move heavy objects or objects with irregular or complicated shapes. Examples of manipulators are tongs, grapples, rotators, etc. A manipulator serves many purposes: to pick up an object, to move it, to shift, turn or lay down any object onto the floor, pallet, platform, or truck handling equipment, or machine. Some types of manipulators are illustrated and various problems are visualized. (EI, 1960)

21. MECHANICAL HANDS HELP WORKERS:  
UNION SPECIAL MACHINE CO.  
Parker, W. R.  
*Plant Engineering*, v. 14, pp. 127-128, March 1960

Similarities between micromanipulation in melectronics and biology are noted. Different types of micromanipulators and typical applications of micromanipulation in biology are discussed. (*EI*, 1961)

22. FEEDING AID FOR PARALYSED  
*The Engineer*, v. 209, no. 5436, p. 577, April 1, 1960

A pedal operated feeding mechanism, devised by A. E. Harvey and J. Ainley, has been named Sonia Serviteur. The principle of the mechanism is similar to the remote handling at a nuclear energy plant. The foot controls are connected to the eating utensils by Bowden cables. A multi-pushbutton switchboard or a painting palette could be handled on the mechanism also. (*EI*, 1960)

23. APPLICATION OF MODERN REMOTE  
HANDLING TECHNIQUES TO UNDER-  
WATER OPERATIONS

Clark, J. W.

Instrument Society of America, Pittsburgh, Pa.  
Preprint 77-NY60, presented at ISA Meeting,  
New York, N.Y., September 26-30, 1960  
(See also *ISA Journal*, v. 8, no. 9, pp. 58-63,  
September 1961)

Electronic command and vision systems which make possible underwater operations below diver depth are discussed, as well as operations in shallow water which were formerly not practical. Designs for both free-swimming and bottom-crawling remote handling machines were presented. Applications include construction and operation of permanent underwater installations, salvage operations, recovery of mineral wealth from below ocean bottom, and numerous military operations. (*EI*, 1961)

24. PROGRAMMED MANIPULATOR CUTS  
FORGING TIME

Baker, P. N., Tomlinson, A.

*Control Engineering*, v. 7, pp. 194-196,  
September 1960

26. LINKAGE-CONTROLLED FINGERS SIMPLIFY  
MOUNTING AND REMOVAL OF REELS  
ON A TAPE DRIVE

*Machine Design*, v. 32, p. 120, November 24, 1960

27. FORCE-REFLECTING ELECTROHYDRAULIC  
SERVOMANIPULATOR

Mosher, R. S., Wendel, B.

*Electro-Technology*, v. 66, pp. 138-141, December  
1960

28. CLOSING THE MANIPULATOR GAP

*Engineering*, v. 191, pp. 103-104,  
January 20, 1961

29. POWER-OPERATED MANIPULATOR

Marsh, J. A., Bates, L. T., Humphreys, D.  
January 18, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 859,162 (assigned to A. C. Wilson  
& Partners, Ltd.)

A power-operated manipulator is designed for remote handling of large loads on the order of one ton. The manipulator comprises a carriage movable along a longitudinal track and a cross trolley movable along a transverse track carried by the carriage, the trolley supporting a vertical telescope arm. Individual hydraulic motors are provided for driving each of the moving elements of the manipulator. (*NSA*, 1961, #7476)

30. MANIPULATING DEVICES INCLUDING  
MASTER AND SLAVE PORTIONS

Griggs, F. J. M.

February 1, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 860,158 (assigned to Pye, Ltd.)

A manipulating device for the remote handling of objects, which consists of master and slave portions, is described. The tongs of the slave portion are normally held in an open position by one or more springs. Operation of the control grip in the master portion, transmitted to the slave by means of one or more control wires

25. MICROMANIPULATOR TECHNIQUES  
Helvev, T. C.  
*IRE Transactions on Medical Electronics*,  
v. ME-7, no. 4, pp. 340-345, October 1960

running over guide pulleys, closes the tongs against the force of the springs. Means are provided by springs inserted into the wire connected to each limb of the tongs to prevent the control wire from becoming dislodged from a guide pulley should one of the limbs strike or be struck by an object. The springs are inoperative in normal operation, but act to take up slack in the control wires if one of the limbs hits an object. (NSA, 1961, #11,282)

31. PUSHBUTTON ROBOT LEARNS FAST:  
**UNIMATE, PRODUCED BY CONSOLIDATED  
CONTROLS CORP.**

*Product Engineering*, v. 32, pp. 72-73,  
March 20, 1961

32. ARTICULATED MANIPULATOR

April 19, 1961

**U.S. Department of Commerce, Washington, D.C.  
British Patent 865,517 (assigned to General Mills,  
Inc.)**

An articulated manipulator (material handling unit) for use in uninhabitable environments is designed with many degrees of freedom. The unit consists of manipulating arms extending from a vehicle provided with a protective cab. This unit is especially suitable for dismantling nuclear aircraft engines. (NSA, 1961, #7043)

33. WE'S LIST OF MANUFACTURERS:  
**AUTOMATIC WELDING EQUIPMENT,  
MANIPULATORS, POSITIONERS**  
*Welding Engineer*, v. 46, p. 52, June 1961

34. MANIPULATING DEVICES HAVING MASTER  
AND SLAVE PORTIONS FOR THE REMOTE  
HANDLING OF OBJECTS

Stephenson, P. H.

July 19, 1961

**U.S. Department of Commerce, Washington, D.C.  
British Patent 873,077 (assigned to Pye, Ltd.)**

A manipulating device for the remote handling of objects is described. The device consists of a horizontal tubular support to opposite ends of which are pivotally attached a master arm and a slave arm. There is a linkage mechanism interconnecting the arms in order that movement can be imparted to the slave arm by movement of the master arm. There is also a manipulating tool at the end of the slave arm operable by controls on the master arm. A mechanism is provided for effecting lateral displacement of the slave arm out of the plane containing

the tubular support and the master arm. Instead of pivoting the master arm of the manipulator to a member which is rigidly attached to the tubular support or through-tube as in prior constructions, the master arm is pivotally attached to a housing which can rotate relative to the through-tube. An electric actuator provides the relative rotation between the master arm and the through-tube. (NSA, 1961, #23,727)

35. MOBOTRY: THE NEW ART OF REMOTE  
HANDLING

Clark, J. W.

*IRE Transactions on Vehicular Communications*,  
v. VC-10, no. 2, pp. 12-24, August 1961

Equipment to perform a great variety of tasks within hostile environments has been designed and built utilizing well-proven electronic techniques. Such systems perform most of the operations which would be performed manually were it possible for a man to enter the hazardous area. Examples of hostile environments include space, the ocean, nuclear laboratories, and numerous others. A simple trinary coding command system has proved quite practical and is capable of commanding mobile remote systems having 50 or more degrees of freedom. Conventional closed-circuit television systems may be used for driving and steering remotely controlled vehicles and for accomplishing manipulative tasks. Two or more such cameras are highly desirable for obtaining good spatial perception. Examples of remotely-controlled systems for hostile environments include the Hughes Mark II Mobot system for nuclear hot laboratories, the R.U.M. (Remote Underwater Manipulator) built by Scripps Institute of Oceanography for scientific and military operation in the depths of the ocean, and a variety of outdoor remotely controlled vehicles. (EEA, 1962, #1287)

36. GRIPPING FORCE SUPPLIED BY UNUSUAL  
HYDRAULIC CIRCUIT; FORGING  
MANIPULATOR DESIGNED AND BUILT  
BY THE ALLIANCE MACHINE CO.

Stuckey, R. L.

*Iron and Steel Engineer*, v. 38, pp. 139-140,  
August 1961

37. REMOTE CONTROL FOR MANIPULATORS  
August 23, 1961

**U.S. Department of Commerce, Washington, D.C.  
British Patent 875,906 (assigned to General Mills,  
Inc.)**

A control unit is designed for regulating a multiplicity of bending, extending, and rotating movements of a remotely controlled handling unit. (NSA, 1961, #26,152)

**38. A REMOTE CONTROLLED MANIPULATOR**

September 6, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 876,736 (assigned to Central Research  
Labs., Inc.)

A remote control manipulator comprising a horizontal tubular support, a master arm, and a slave arm is designed so that manipulations to the left or right of the normal working area of the slave arm can be performed in spite of the limited viewing area of the shielding window. This increase in the range of maneuverability of the manipulator is accomplished through providing means for displacing the slave arm with respect to the master arm. (NSA, 1961, #29,341)

**39. REMOTE CONTROL MANIPULATORS**

October 18, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 880,152 (assigned to General Mills,  
Inc.)

A remote control manipulator is designed with an improved driving mechanism utilizing a differential planetary gear speed reducer. The manipulator design provides a convenient, efficient, and compact assembly of parts with a high reduction ratio between the driving motor and rotatable member. (NSA, 1962, #307)

**40. DRIVEN PIVOTAL JOINT FOR  
MANIPULATORS**

October 18, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 880,153 (assigned to General Mills,  
Inc.)

A driven pivotal joint for remote control manipulators is designed for compactness. The joint comprises a drive portion and a driven portion pivotally connected with one another, the drive portion including a driven motor mounted in a supporting frame with a driven shaft connected to the input of a differential planetary gear speed

reducer. In this way, it is possible to use a high-speed motor, e.g., 6000 rpm, to provide higher horsepower in a smaller space. (NSA, 1962, #308)

**41. ROBOTS STAR AT OPENING OF  
AUTOMATION CENTER; USI ROBODYNE**

*Machinery*, v. 68, pp. 126-127, December 1961

**42. SOCKET-WRENCH MANIPULATOR**

Vernon, J. A.

*Machinery*, v. 68, p. 135, January 1962

**43. IMPROVEMENTS IN AND RELATING TO  
ELECTRICAL REMOTE CONTROL**

**APPARATUS**

February 14, 1962

U.S. Department of Commerce, Washington, D.C.  
British Patent 889,319 (assigned to Zaklad  
Wytwarzace Glosnikow "Tonsil")

An electric remote manipulator, also called an "artificial hand," is designed for carrying out movements in any direction and at any length. The manipulator contains a transmitter and a receiver, both identical and each comprising four selsyns mounted in a cascade with their axes perpendicular to each other. The fourth selsyn translates rotational movement into linear movement. (NSA, 1962, 13,193)

**44. ROBOT UNIT POSITIONS AND FEEDS  
SMALL PARTS; TRANSEROBOT 200**

*Tool and Manufacturing Engineer*, v. 48, p. 117,  
February 1962

**45. ADAPTIVE MECHANICAL HAND FEELS  
ITS WAY**

*Control Engineering*, v. 9, no. 2, p. 21, February  
1962

(The following article appears in its entirety.) A standard AMF remote handling arm—specially modified and controlled by a digital computer with an adaptive mode—has been "taught" by a graduate student at MIT to find, handle, and move simple objects. The mechanical hand and arm are fitted with 30 sensors, 18 of which are kinesthetic, sensing the position of the manipulator, the

rest being pressure transducers. The program of the TX-0 computer has 36 subroutines that react to signals from these sensors, adapting to what the hand feels as it gropes along the floor.

46. SERVO SYSTEM CONTROLS MANIPULATOR'S SPEEDS

Delano, A. J.

*Hydraulics and Pneumatics*, v. 15, pp. 88-89,  
March 1962

47. DESIGNING AN AUTOMATED PARTS TRANSFER DEVICE; USI TRANSEROBOT

Goodell, J. D.

*Automation*, v. 9, p. 29, April 1962

48. SUMMARY DESCRIPTION OF THE SCIENTIFIC PAYLOAD FOR SURVEYOR MISSION

July 3, 1962

Hughes Aircraft Co., Culver City, Calif.  
R-ED-6116, Vol. III, Pt. 3

## GENERAL MANIPULATORS FOR RADIOACTIVE MATERIALS

### 49. A REMOTE HANDLING MANIPULATOR FOR CHEMICAL ANALYSIS

Howarth, A. J.

April 19, 1956

United Kingdom Atomic Energy Authority,  
Industrial Group, Windscale Works,  
Sellafield, Cumberland, England  
IGO-R/W-26, IGC-ARDC/P-191

A new approach to remote handling for chemical analytical purposes is described, which provides a cheap alternative to the American master-slave manipulator. Intended primarily for use in the Dounreay high-activity laboratories, it supplies most of the services required by the analyst, by an over-the-wall technique, while still permitting the fitting of a shield roof over the cubicle. Activities of up to 80 curies may be handled. (NSA, 1959, #19,128)

### 50. NUCLEAR REACTORS POSE NEW PROBLEMS IN MECHANICAL DESIGN; REMOTE HANDLING EQUIPMENT

*Product Engineering*, v. 27, pp. 206-210,  
April 1956

### 51. REMOTE-CONTROL HANDLING DEVICES FOR WORK BEHIND SHIELDING WALLS OF HOT LABS

Ring, F., Jr.

*Mechanical Engineering*, v. 78, pp. 828-831,  
September 1956

### 52. DIDO CONTROL SYSTEM

Newman, L. W. J.

*Nuclear Engineering*, v. 2, no. 10, pp. 23-27,  
January 1957

The system for Harwell's new DIDO reactor, using cadmium neutron absorber, comprises six-coarse control shut-off units of signal arm type, single fine control rod, and two safety rods. The control arms are driven through slave gearboxes ganged electrically to the master gearbox. Fine control is operated from a gearbox controlled by a closed-loop servo system. (EI, 1957)

### 53. MASTER-SLAVE MANIPULATORS. IMPROVED SEALING AGAINST LEAKAGE FROM CELL, HANDLING AND SERVICING

Curtis, W. K.

October 1957

United Kingdom Atomic Energy Authority, Research Group, Atomic Energy Research Establishment, Harwell, Berks, England  
AERE-ES/R-2412

A description of the equipment and method of handling a manipulator in and out of operating position for servicing is given. The master-slave manipulator can be used under high alpha conditions. (NSA, 1959, #13,442)

### 54. SUMMARY REPORT ON MOBILE REMOTE HANDLER

Karin, R. S., Figenshau, J. K., Rose, G. R., Hyrcak, P.

November 20, 1957

General Mills, Inc., Minneapolis, Minn.  
R-1799, SCDC-878

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A Mobile Remote Handler (MRH) will basically permit an operator to carry out the following: (1) to move safely and freely about in a radiation area where gamma radiation may greatly exceed biological tolerances; (2) to perform various remote operations on equipment or tools in the radiation area. As the name indicates, this device will be mobile, will provide means of remote operation, and will completely enclose the operator in a protective radiation shield. The purpose of this report is to present a complete description of a finalized MRH design and to briefly review the considerations involved in developing this recommended design.

### 55. REMOTE-CONTROL APPARATUS FOR USE WITH RADIOACTIVE MATERIAL (APPAREILS DE COMMANDE À DISTANCE POUR LA MANIPULATION DE MATERIAUX IRRADIÉS)

Moll, J.

*Atomkernenergie*, v. 2, pp. 482-486, 1957 (in German)  
(French translation available as CEA-tr-A-495,  
U.S. Atomic Energy Commission, Rockville, Md.)

56. RADIOISOTOPE CAPSULES SEALED BY  
REMOTE CONTROL WELDING  
*Welding Journal*, v. 37, p. 140, February 1958

57. SIXTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, MARCH 19-21, 1958, INTERNATIONAL AMPHITHEATRE, CHICAGO, ILLINOIS

Ring, F., Jr., Compiler

April 1959

American Institute of Chemical Engineers,  
New York, N.Y.

(Obtainable as TID-7556, U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

Eighteen papers are presented on design, equipment, and operation of hot laboratories. Minutes of a round table panel discussion presented at the conference are included. (NSA, 1959, #14,341)

58. NEW MULTI-CELL FACILITY IN IDAHO

Durrill, D. C., Dwigans, R. D.

In "Proceedings of the Sixth Hot Laboratories and Equipment Conference, Chicago, Ill.,

March 19-21, 1958," pp. 73-80

American Institute of Chemical Engineers,  
New York, N.Y.

(Obtainable in TID-7556, U.S. Dept. of  
Commerce, Office of Technical Services,  
Washington, D.C.)

Construction of a new facility comprising four small hot cells is nearly complete at the Aircraft Nuclear Propulsion test station operated by the General Electric Company in Idaho. Special features include split-level operating areas, concrete-filled vault-type doors for personnel and equipment entry, a remotely operated underfloor dolly system, and a remote vacuum cleaning and washdown system. (NSA, 1959, #14,349)

59. MODIFICATIONS TO MASTER SLAVES AT  
BETTIS HOT LABORATORY

Stearns, E. H.

In "Proceedings of the Sixth Hot Laboratories and Equipment Conference, Chicago, Ill.,

March 19-21, 1958," pp. 123-129

American Institute of Chemical Engineers,  
New York, N.Y.

(Obtainable in TID-7556, U.S. Dept. of  
Commerce, Office of Technical Services,  
Washington, D.C.)

Several modifications were made to both Argonne Model 4 and Model 8 Master-Slave Manipulators to meet

the operating conditions at Bettis. Most of these modifications were made to increase the capacity or prevent failures on the original units. (NSA, 1959, #14,355)

60. REMOVING RADIOACTIVE CARTRIDGES LODGED INSIDE REACTORS  
*The Engineer*, v. 205, p. 983, June 27, 1958

61. REMOTE MAINTENANCE EXPERIMENTAL WORK ON A REACTOR SYSTEM PUMP

McDonald, W. B., McGlothlan, C. K., Storto, E.

July 25, 1958

Oak Ridge National Laboratory, Tenn.

CF-58-4-93 (Second Issue), W-7405-eng-26

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

An experimentally determined evaluation of standard-remote-handling equipment applied to the problems associated with remote maintenance of a typical reactor system component is presented. It is concluded that commercially available equipment can be used and that a good technician can rapidly learn the use of manipulators required in remote maintenance. The use of closed circuit television in maintenance is possible; however, further development of radiation-resistant equipment is required. (NSA, 1959, #1804)

62. ELECTRONIC MASTER SLAVE  
MANIPULATOR

Goertz, R. C., Thompson, W. M., Olsen, R. A.

August 5, 1958

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,846,084 (assigned to U.S. Atomic  
Energy Commission, Rockville, Md.)

A remote control manipulator is described in which the master and slave arms are electrically connected to produce the desired motions. A response signal is provided in the master unit in order that the operator may sense a feel of the object and may not thereby exert such pressures that would ordinarily damage delicate objects. This apparatus will permit the manipulation of objects at a great distance, that may be viewed over a closed TV circuit, thereby permitting a remote operator to carry out operations in an extremely dangerous area with complete safety. (NSA, 1959, #1003)

63. BRAZING BY REMOTE CONTROL.  
INDUCTION HEATING FINDS APPLICATIONS IN ATOMIC ENERGY  
*Nuclear Power*, v. 3, p. 503, October 1958

The applications of brazing by remote control using induction heating are described. The work of Delapena and Son in developing the technique is reviewed. (NSA, 1959, #229)

**64. REMOTE MAINTENANCE TECHNIQUES FOR THE PROCESSING REFABRICATION EXPERIMENT**

Stoker, D. J.

December 1, 1958

North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.

NAA-SR-2981, AT-11-1-GEN-8

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

In maintaining in-cell process and handling equipment, it is essential that the equipment piece or its components can be remotely replaced. The general techniques developed for replacement of PRE in-cell equipment or equipment components are outlined. General maintenance philosophy is outlined. Utility couplings, method of supplying utilities, mounting of motors, and coupling drive shafts, gaskets, and fasteners are described. (NSA, 1959, #3,822)

**65. SOVERMENNOYE OBORUDOVANIYE DLYA RABOTY S RADIOAKTIVNYMI IZOTOPAMI; SBORNIK MATERIALOV (MODERN EQUIPMENT FOR WORKING WITH RADIOACTIVE ISOTOPES; COLLECTION OF MATERIALS)**  
Zavodchikova, A. I., Popova, S. M., Editors  
Izd-vo Glavnogo Upravleniya po Ispol'zovaniyu Atomnoy Energii pri Sovete M-va SSSR, Moscow, 1958  
(Obtainable as Supplement 5 to *Atomnaya Energiya*, 1958)

A book for personnel engaged in activities involving the use of radioisotopes is presented. Three articles deal with modern techniques, methods, and apparatus for handling radioisotopes. Schematic diagrams and illustrations of modern equipment for remote handling and detailed descriptions of operating principles are given. (NSA, 1959, #18,075)

**66. DEVELOPMENT IN NUCLEAR HANDLING EQUIPMENT**  
Dollard, W. J.  
In "Advances in Materials Handling"

American Society of Mechanical Engineers, New York, N.Y., 1958

The handling of fuel elements of a pressurized-water reactor by remote means is presented. Remote-handling equipment for homogeneous reactors is also discussed. (NSA, 1959, #10,003)

**67. HANDLING PROBLEMS WITH RADIOACTIVE MATERIALS**

Ring, F., Jr.

In "Advances in Materials Handling"

American Society of Mechanical Engineers, New York, N.Y., 1958

Various types of remote-control equipment are discussed for storage, packaging, and shipping of radioactive materials. (NSA, 1959, #10,004)

**68. HOT LABORATORY EQUIPMENT [SECOND EDITION]**

Stang, L. G., Jr., Compiler

U.S. Atomic Energy Commission, Rockville, Md., 1958

Equipment is described and illustrated which was designed for use in handling radioactive materials. Descriptions are included of facilities, equipment, and accessories for handling moderate to large amounts of radioactive materials. Standard commercially available items designed for nonradioactive applications which have been modified for hot laboratory use are included. The equipment listed includes enclosures for radioactive operations, viewing equipment, manipulators, accessories, chemical processing equipment, in-process fluid transfer devices, equipment for measuring chemical and physical properties, machine tools, materials-handling equipment, monitoring and decontamination equipment, irradiation facilities, special protective clothing, and shielding materials. (NSA, 1959, #12,534)

**69. A REMOTELY MAINTAINABLE RECTILINEAR MANIPULATOR FOR THE PROCESSING REFABRICATION EXPERIMENT (PRE)**

Streechon, G. P.

March 15, 1959

North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.  
NAA-SR-3265, AT-11-1, GEN-8

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

To aid in the handling and maintenance of in-cell process equipment, a remotely maintainable, general-purpose rectilinear manipulator is required in the PRE. A description is given of the modifications to a commercially available rectilinear manipulator which were required to facilitate the remote removal, replacement, and maintenance of the manipulator and its major components. The feasibility of the PRE modifications and operating and maintenance techniques was satisfactorily demonstrated on an in-cell mockup of this manipulator. An in-cell crane and/or a through-roof hoist can effect remote maintenance and removal of the carriage and bridge of the manipulator. (NSA, 1959, #13,451)

70. LIQUID METAL FUEL REACTOR EXPERIMENT. ANNUAL TECHNICAL REPORT

March 25, 1959

Babcock and Wilcox Co., Atomic Energy Div.,  
Lynchburg, Va.

BAW-1136, AT(30-1)-1940

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

...Standard and modified remote handling and remote viewing equipment for use in the LMFRE-I facility is described. (NSA, 1959, #2200)

71. THE DESIGNING AND FABRICATION OF REMOTE HANDLING GEAR FOR BETA-ACTIVE MATERIALS

Hirling, J.

*Energia és Atomtechnika*, v. 12, pp. 181-182,  
February-March 1959 (in Hungarian)

Mechanical descriptions, a photograph, and five sketches are given of a small manipulation chamber and its remote handling gear. The chamber is made of plexiglas. The front wall is 20 mm thick; the sides and slant top, 10 mm. The walls can be lined with lead bricks if shielding against gamma radiation is desired. The front wall has two glove ports. The four remote handling rods (two in front and one on each side) are installed in spherical lead sockets that permit rotation in a maximum angle of 60 deg in any direction. Five pairs of jaws and two types of pistol grips (one contracts, the other releases the jaws when the triggers are pressed) are illustrated. The jaws are chromium plated to prevent corrosion by decontamination. (NSA, 1960, #13,866)

72. PROCEEDINGS OF THE SEVENTH HOT LABORATORIES AND EQUIPMENT CONFERENCE, PUBLIC AUDITORIUM, CLEVELAND, OHIO, APRIL 7-9, 1959

Engineers Joint Council, American Society of Mechanical Engineers, New York, N.Y., 1959

Fifty-six papers are presented on recent innovations in equipment for radiation laboratories and in laboratory facility design. Separate abstracts are presented for some of the papers.

73. DESIGN CRITERIA FOR HEAVY-DUTY MASTER-SLAVE MANIPULATOR

Jelatis, D. G.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 163-168  
American Society of Mechanical Engineers,  
New York, N.Y.

Consideration of some limitations of existing master-slave manipulators leads to the formulation of criteria for heavy-duty manipulators incorporating the salient features of the master-slave principle, in particular force-reflection and bilateral compliance. Force multiplication is introduced to reduce operator effort, combined with automatic indexing to allow full coverage of the hot area. (NSA, 1959, #17,605)

74. RECTILINEAR MANIPULATOR BNL MODEL 4

Stang, L. G., Jr.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 169-176  
American Society of Mechanical Engineers,  
New York, N.Y.

A new all-mechanical rectilinear manipulator is described. Operation of this manipulator is identical to that of the presently used BNL Model 3 Rectilinear Manipulator. However, the slot in the front shielding wall through which the bridge of the Model 3 Manipulator passes has been eliminated by converting all motions to rotary motions and transmitting them through the front wall by means of rotating drive shafts located at the ends of the bench or hot cell. This feature prevents the escape of scattered radiation or contamination and permits use of the manipulator in a totally sealed cell in which an inert atmosphere might be maintained. (NSA, 1959, #17,606)

75. FRENCH MASTER SLAVES

Pesenti, P., Chérel, G.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 177-182  
American Society of Mechanical Engineers, New York, N.Y.

The manipulators designed and built at Saclay are described briefly. These manipulators are prototypes and are used in experimental work. A detailed description is not given, but their main characteristics are outlined. (NSA, 1959, #17,607)

76. DRY STORAGE FACILITY FOR IRRADIATED MATERIAL

Lewis, S. O., Dismuke, S. E.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 199-206  
American Society of Mechanical Engineers, New York, N.Y.

A shielded dry storage facility for storing canned radioactive materials is described. There are 200 cylindrical receptacles, 6½ in. inside diameter by 40 in. deep, which receive the 6-in.-D storage cans. A remotely operated manipulator is used for transferring the canned materials in and out of this storage facility. (NSA, 1959, #17,609)

77. FUEL ROD FABRICATION DEVICE

Golding, T. A., Janeves, D., Fallandy, M. A., Vonderahe, F. E., Mattern, K. L.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 402-408  
American Society of Mechanical Engineers, New York, N.Y.

A remotely operated and remotely maintained fuel rod fabrication device is described. The device is for fabrication of highly radioactive reprocessed fuel slugs into fuel rods for re-irradiation in the SRE (Sodium Reactor Experiment). Because of the high level of radioactivity in the fuel and the nature of the operational cycle of loading, fabrication and unloading of the device must be controlled remotely. Maintenance of the equipment also must be accomplished remotely. An out-of-cell console is used to control pneumatic and electrical actuators on the device. The mechanisms are remotely replaceable unit subassemblies, facilitating maintenance. A prototype de-

vise for fabrication of short, dummy fuel rods has been built and remotely operated. (NSA, 1959, #17,631)

78. RADIOACTIVE MATERIAL HANDLING

Maharam, A. L., Fouse, R. R.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 424-432  
American Society of Mechanical Engineers, New York, N.Y.

Radioactive material handling is discussed both from the problem of correct design and actual operations. Material handling equipment is described from the point of view of activity levels, size of the samples, ease and dependability of operation, and problems encountered in contamination control. (NSA, 1959, #17,634)

79. REMOTE FABRICATION OF SRE FUEL RODS IN THE PROCESSING REFABRICATION EXPERIMENT

Golding, T. A., Janeves, D., Fallandy, M. A., Vonderahe, F. E., Mattern, K. L.

May 1, 1959

North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.  
NAA-SR-2989, AT-11-1-GEN-8

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The Rod Fabrication Device is used to fabricate SRE fuel rods, entirely by remote control, using pyroprocessed metallic uranium fuel. It is designed to accept six thin-wall stainless steel fuel cans loaded with fuel slugs, outgas the slugs and cans, partially fill each can with NaK, place a stainless steel cap in the top of each can, position a welding chill block around each can and weld each cap to its can with a leak-tight, structurally-sound heliarc weld. Design also permits remote maintenance and/or replacement, in-cell, of any mechanical component of the assembly. Experimental effort has consisted of test, evaluation, and modification of the basic operating mechanisms, with emphasis on the development of remotely maintainable mechanisms and techniques to achieve consistently good cap-to-can seals and simple, reliable mechanical components. In the PRE experimental program, short dummy fuel rods were consistently made with leak-tight and structurally sound welds. Conclusions resulting from the operational tests were that: (1) mechanisms should be remotely maintained by replacement of complete actuating assemblies rather than attempting to

replace small detail parts remotely; (2) a simple means of remotely replacing dynamic shaft seals has been devised; and (3) it is important that good control of welding conditions be consistently maintained. (NSA, 1959, #13,532)

80. TESTING OF SODIUM PIPE JOINTS AND DEVELOPMENT OF REMOTE REPAIR TOOLS FOR THE SDR

Belofsky, H., Lazarus, S., Minushkin, B.

May 22, 1959

Nuclear Development Corp. of America,  
White Plains, N.Y.

NDA-84-20, AT(30-3)-256

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

Pre-prototype tools have been designed, constructed, and successfully tested over working distances approximating full-scale reactor dimensions, thus demonstrating the feasibility of remotely repairing and replacing a fuel-coolant tube in an SDR. These tools and their extensions performed the operations of internal tube cutoff, facing, chip collection, external tube cutoff, internal straight access and internal right angle access fusion butt welding over a working distance of 30 ft. It is estimated that the total time required for the repair or replacement of a fuel-coolant tube using remote repair techniques is approximately 13 hr with no required waiting period. On the other hand, it has been estimated that it takes approximately 16 hr plus a 14-day waiting period to effect a fuel-coolant tube replacement by manual techniques. It is this two-week radioactive decay time which may be eliminated by the use of remote maintenance techniques. In addition to savings in reactor maintenance costs, savings in construction may also be possible because simpler neutron shielding is used. Tools similar to those designed in this program may be utilized for remote repair of pressure tube reactors of similar configurations, and for repair of tubular heat exchangers wherever accessibility for manual maintenance is hazardous or costly. . . . (NSA, 1959, #15,778)

81. SHIELDING MANIPULATOR FOR RADIOACTIVE MATERIAL

Ruehle, W. G., Jr.

June 2, 1959

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,889,464 (assigned to Lermac, Inc.)

A shielded manipulator arrangement is described which overcomes the size limitations of lead ball-and-

socket manipulators. The device consists of a heavy-metal cylinder mounted on bearings in the shield wall with its axis vertical. The cylinder has a vertical slice removed from its center so that a heavy-metal disc fits in on edge. The disc is bored diametrically to receive the manipulating tongs and is also provided with bearings to ease vertical movement of the tongs. The movement of the cylinder provides lateral manipulation. The pieces are so fitted with curved interfaces that radiation does not escape through cracks. (NSA, 1959, #21,152)

82. A NUCLEAR GROUND SUPPORT EXPERIMENT WITH QUICK DISCONNECT DEVICES

Marjon, P. L.

June 29, 1959

Convair, Nuclear Aircraft Research Facility,  
Fort Worth, Texas

R-MR-N-247, NARF-59-24T, AF 33(600)-32054

An experiment in remote handling was conducted to provide information on equipment needs for ground support of nuclear aircraft. Representative, commercially available components with quick-operation features were used in remote handling tests. An evaluation was made of the causes of difficulties encountered in remote operations. Recommendations are made to guide the design of handling equipment for nuclear airplane maintenance applications.

83. OPERATION AND TESTING OF THE YANKEE UNIVERSAL FUEL HANDLING TOOL

Balog, L. J.

June 1959

Westinghouse Electric Corporation, Atomic Power  
Dept., Pittsburgh, Pa.

YAEC-137, AT (30-3)-222-sc-1

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

The Universal Handling Tool represents the implement with which the core of the Yankee plant will be initially loaded and subsequently unloaded and refueled. With the objectives of reducing refueling time to a minimum and simplifying the refueling operation in general, the universal handling concept was conceived and developed. The Universal Handling Tool, which is capable of manipulating guide tubes, drive shafts, control rods, control rod followers and fuel assemblies, overcomes the need of requiring several tools to accomplish handling of these various reactor components. Consequently, an appreciable savings in time is realized since the time associated with changing tools, in the multitool concept, to handle

each specific component group does not exist. Tests were performed on the Universal Handling Tool to establish its practicality for application in the Yankee plant. A maximum load test was carried out to establish the ability of the tool to lift and support more than five times the load represented by the weight of a fuel assembly. A fuel assembly is the heaviest reactor element that the tool will manipulate in the plant. Further testing included the manipulation of mocked-up versions of each of the reactor components that the tool will be called upon to handle in the Yankee plant. This phase of testing was carried out underwater in the WAPD deep pit facility to simulate actual refueling conditions in the plant. (NSA, 1959, #20,738)

**84. AN ELEVATING TURNTABLE FOR REMOTE MAINTENANCE IN THE PROCESSING-REFABRICATION EXPERIMENT**

Stoker, D. J.

August 15, 1959

North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.

NAA-SR-3264, AT-11-1-GEN-8

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A special in-cell maintenance workbench is required to aid in the remote maintenance of radioactive PRE in-cell equipment. The development and demonstration of such a bench which rotates, moves in a vertical direction, is remotely operable, and has all in-cell components remotely maintainable are outlined. (NSA, 1959, #20,164)

**85. EQUIPMENT FOR HANDLING MILLICURIE AMOUNTS OF RADIOISOTOPES**

Blaedel, W. J., Olsen, E. D.

*Analytical Chemistry*, v. 31, p. 1608, September 1959

A description of laboratory equipment for the handling of millicurie amounts of radioisotopes is given. (NSA, 1959, #20,059)

**86. REMOTE MAINTENANCE PROCEDURE REPORT**

Draper, B. D., Hise, E. C.

November 26, 1959

Oak Ridge National Laboratory, Tenn.

CF-59-11-128

Development of methods and remote tools to place a patch in the Homogeneous Reactor Test (HRT) core vessel is described. The core vessel patch will either seal it or permit only limited transfer of D<sub>2</sub>O from the reflec-

tor region to the core region. This will allow for return of the HRT to two-region operation without replacing the core vessel. Development of the patch is described, and detailed procedures for the operation are given. (NSA, 1961, #11,154)

**87. TASK PERFORMANCE WITH THE CRL MODEL 8 MASTER-SLAVE MANIPULATOR AS A FUNCTION OF COLOR-CODING, DISTANCE, AND PRACTICE**

Baker, D. F., Crawford, B. M.

November 1959

Wright Air Development Center, Aerospace Medical Lab., Wright-Patterson AFB, Ohio  
WADC-TR-59-728, Project 7184

The ability of Master-Slave Manipulator (CRL Model 8) operators to identify the slave hands and their movements with corresponding components and functions of the human body was investigated. A handling task involving rearrangement of blocks was devised to be performed with standard slave jaws (red jaws) and with slave jaws modified so that the jaw corresponding to the thumb of the operator was green. The task was performed at distances of 9, 36, and 63 in. from the radiation shield. Work time as a function of task distance was investigated, and work ratios, based on mean time scores for direct handling vs. remote handling, were determined. (NSA, 1961, #4116)

**88. IMPROVEMENTS IN OR RELATING TO APPARATUS FOR THE MANIPULATION OF RADIOACTIVE MATERIALS**

Vogel, P.

December 16, 1959

U.S. Department of Commerce, Washington, D.C.  
British Patent 825,645

A hand-grip manually operated remote manipulator is described. (NSA, 1960, #9,620)

**89. A STUDY OF TECHNIQUES AND THE DEVELOPMENT OF EQUIPMENT FOR DECANNING EBR-II FUEL ELEMENTS**

Simon, J. P.

January 1960

Argonne National Laboratory, Lemont, Ill.

ANL-6106, W-31-109-eng-38

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

Remotely operated, semi-automatic machines, designed to effect the mechanical disassembly (i.e., decanning) of

spent fuel elements from the Experimental Breeder Reactor-II, were developed. The machines described are laboratory models which successfully decanned simulated fuel elements. They are electrically or pneumatically operated and are capable of decanning three fuel elements per minute without the routine use of manipulators. Each machine is made up of functional units which are sequentially placed to eliminate handling between steps of the decanning operation and which are easily removable for replacement or maintenance. In the first of the two machines described, pneumatically operated devices prepare the fuel element for a rotary shearing operation which cuts the tubing jacket along a helical circumferential path as it is being removed. The alternate machine removes the jacket by means of a series of shearing rolls. Both machines are served by auxiliary mechanisms, such as inspection jigs, fuel and scrap choppers, and transfer magazines. (NSA, 1960, #9578)

**90. EXPERIENCE IN THE HANDLING OF SEALED GAMMA-ACTIVE ISOTOPES**

Hirling, J.

*Energia és Atomtechnika*, v. 13, pp. 82-85,  
January-February 1960 (in Hungarian)

Transport casks for sealed gamma-active isotopes and laboratory equipment (portable lead shields, two types of remote handling rods) used to unpack the isotopes and to place them into capsules are described. For its own use and for other institutes as well, the Csepel Iron and Steel Works in 1959 prepared 180 capsules of Soviet gamma-active isotopes, the equivalent of about 1.0 kg of Ra. The personnel assigned to this work was exposed to only 23 to 37% of the maximum permissible exposure. (NSA, 1960, #16,907)

**91. FUEL HANDLING MECHANISM**

Koch, L. J., Hutter, E.

February 9, 1960

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,924,483 (assigned to U.S. Atomic Energy Commission, Rockville, Md.)

A remotely operable handling device specifically adapted for the handling of vertically disposed fuel rods in a nuclear reactor was developed. The device consists essentially of an elongated tubular member having a gripping device at the lower end of the pivoted jaw type adapted to grip an enlarged head on the upper end of the workpiece. The device includes a sensing element which engages the enlarged head and is displaced to

remotely indicate when the workpiece is in the proper position to be engaged by the jaws. (NSA, 1960, #15,736)

**92. MAINTENANCE DEVICE FOR NUCLEAR REACTORS**

March 4, 1960

U.S. Department of Commerce, Washington, D.C.  
French Patent 1,210,207 (assigned to United Kingdom Atomic Energy Authority)

In order to enable inspection of the inside of nuclear reactor channels and the performance of maintenance work therein, a maintenance unit that can be introduced into a reactor channel is offered. It is a box in which a television camera, having an elongated form, is mounted. A rotatable tool is also arranged inside this box in front of the camera, and means are provided in the box which bypass the camera for controlling the tool mounted in a tool holder. Suitably, the camera is mounted eccentrically in the cylindrical box so as to leave space alongside it for a flexible cable controlling the tools and coupled at its other end with an electric motor arranged behind the camera. (NSA, 1961, #27,128)

**93. ART REMOVAL AND DISASSEMBLY**

Abbatiello, A. A., McQuilkin, F. R.

March 18, 1960

Oak Ridge National Laboratory, Tenn.

ORNL-2464, W-7405-eng-26

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A study of a high-level-activity hot cell for the major dissection of the ART was made. Such dissection was necessary to obtain metallurgical and design data on which future high-performance reactors might be based. The study included severing and removing the reactor from the test cell after operation, a procedure for a component removal sequence, and a proposed disassembly building facility. Evaluations of handling, measuring, and cutting techniques for remote work are presented. Although these are based on limited experimental work, progress is adequate to indicate their potential value for any high-level reactors which must be handled after irradiation. In many cases details of the work in the form of the original report have been included in the Appendix. With the termination of the ART project in September 1957, the draft for what was to have been a status report was revised to become this termination report. Thus, the plans and experimental work are recorded for those who

may find the information useful on similar problems.  
(NSA, 1960, #11,266)

**94. REMOTE-CONTROL EQUIPMENT**

Raleigh, H. D., Compiler  
March 1960

U.S. Atomic Energy Commission, Technical  
Information Service Extension, Rockville, Md.  
Literature Search  
(Obtainable as TID-3549, U.S. Dept. of  
Commerce, Office of Technical Services,  
Washington, D.C.)

Included are 149 references on remote-control equipment used in operations that take place under highly radioactive conditions. The majority of the references pertains to equipment used in hot laboratories, but also covered are reactor fuel element handling equipment, nuclear aircraft maintenance equipment, and servomechanisms. (NSA, 1960, #10,606)

**95. LIQUID METAL FUEL REACTOR EXPERIMENT, RESEARCH AND DEVELOPMENT OF REMOTE MAINTENANCE**

Maynard, W. H.

March 1960 (changed from "Official Use Only" on  
October 18, 1960)  
Babcock and Wilcox Co., Atomic Energy Div.,  
Lynchburg, Va.  
Final Report, BAW-1184, AT(30-1)-1940  
(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

The development and operational testing of remotely controlled maintenance equipment for use in the Liquid Metal Fuel Reactor are described. The performance of stationary and mobile remote viewing equipment, remote handling using a mobile manipulator, remotely controlled cranes and utility vehicles, and remote-control systems is reported. (NSA, 1961, #3663)

**96. HOMOGENEOUS REACTOR PROGRAM QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JANUARY 31, 1960**

April 29, 1960  
Oak Ridge National Laboratory, Tenn.  
ORNL-2920, W-7405-eng-26

... A universal periscope manipulator which provides for gear-driven movements and smooth rotation of various optical core-inspection devices was designed, constructed, and tested.... (NSA, 1960, #18,647)

**97. FUEL HANDLING AT BERKELEY**

*Nuclear Engineering*, v. 5, pp. 164-168, April 1960

The design and construction of the fuel-handling equipment for loading Berkeley reactors are discussed. Instead of one or two multi-purpose machines, five or six specialized units will be installed on the charge face. Design details are given for the skirts (support structures), chute machine, charge/discharge machines, fuel element loader, control rod actuators, and observation and removal equipment. (NSA, 1960, #13,492)

**98. PIQUA PROTOTYPE HANDLING SYSTEM**

Nadler, H.

May 1, 1960

North American Aviation, Inc., Atomics  
International Div., Canoga Park, Calif.

NAA-SR-4361, AT-11-1-GEN-8

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

Equipment has been developed to handle the fuel elements and control rods for the Piqua (OMR) Reactor. With the handling machine, which consists of a shielded cask mounted on a gantry, a fuel element can be replaced in the core in about 27 min. To shift from fuel element to control rod handling takes about 30 min. Functional simplicity and reliability highlight the performance of this handling system. (NSA, 1960, #15,457)

**99. REMOTE-CONTROL MANIPULATOR**

May 4, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 834,244 (assigned to U.S. Atomic  
Energy Commission, Rockville, Md.)

A master-slave arm remote manipulator is described.  
(NSA, 1960, #14,935)

**100. AN IMPROVED REMOTE-CONTROL MANIPULATOR**

May 11, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 834,663 (assigned to U.S. Atomic  
Energy Commission, Rockville, Md.)

The design of a remote-control manipulator of the type in which motions of a master unit are reproduced by a slave unit is presented. This remote-control manipulator employs electrical connections between the master unit and the slave unit instead of mechanical connections. (NSA, 1960, #19079)

**101. IMPROVEMENTS IN OR RELATING TO  
REMOTE-CONTROL EQUIPMENT FOR  
TRANSMITTING ROTARY MOTION**

Case-Newton, R., Howarth, A. J.

June 15, 1960

U.S. Department of Commerce, Washington, D.C.

British Patent 837,734 (assigned to United  
Kingdom Atomic Energy Authority, Great Britain)

A remote-control unit was invented for manipulation of apparatus behind a shielding wall; it comprises a frame supporting a series of rotatable spaced rings and with internal wheels engaging these rings through gaps in the frame. This unit, in conjunction with flexible cables running through the shielding wall, can be used to operate apparatus, e.g., those for colorimetric comparison of solutions. (NSA, 1960, #21,637)

**102. MAINTENANCE DEVICE FOR NUCLEAR  
REACTORS**

July 6, 1960

U.S. Department of Commerce, Washington, D.C.

French Patent 1,225,987 (assigned to United  
Kingdom Atomic Energy Authority)

Television equipment for remote viewing of the inner structure of a nuclear reactor is offered. This equipment includes a television camera movably mounted on an arm, which is in its turn movably mounted on a support, and this equipment enables the introduction of the said camera, with the arm and the support, into a hole that gives access to the inner reactor structure and enables the turning of the support on its own axis and the control of its vertical position. After introduction the support is laterally displaceable by the equipment to point the camera in different directions. (NSA, 1961, #27,171)

**103. IMPROVEMENTS IN REMOTE CONTROL  
DEVICES**

Dean, S.

August 10, 1960

U.S. Department of Commerce, Washington, D.C.

British Patent 834,941 (assigned to Commissariat  
à l'Énergie Atomique, Paris, France)

A remote-control device was invented which eliminates most of the gears, pulleys, and cables usual on such devices for handling radioactive materials behind a shield. The device comprises two frames, one actuated by the operator and the other carrying manipulation means, e.g., tongs; the two frames are connected by three identical mechanisms whereby a motion of the first frame is trans-

mitted to the second. The manipulation means is actuated by flexible cables. Drawings are given for a configuration of the invention where pivotal connections between the mechanisms and the frames are cardan joints and the whole device is counter-balanced for maximum sensitivity of operation. (NSA, 1960, #24,341)

**104. REMOTELY OPERATED MANIPULATORS  
MANUFACTURED FOR HANDLING  
RADIOISOTOPES**

Hirling, J., Fenyvesi, E.

*Energia és Atomtechnika*, v. 13, pp. 379-381,  
August 1960 (in Hungarian)

A newly designed and constructed unit makes it possible to handle radioactive materials behind a barrier, although it cannot be used for operations within a closed cell. The movements applied to the handle are transferred to the operating units on the hot side by steel cables. The unit is built on a carriage that can be displaced or fixed in the desired position on its rail. Eight different types of motions can be performed. The unit weighs 3.35 kg. Design details are given. (NSA, 1961, #304)

**105. DEVICE FOR HANDLING MATERIALS**

September 2, 1960

U.S. Department of Commerce, Washington, D.C.

French Patent 1,228,812 (assigned to  
Babcock & Wilcox, Ltd.)

In a nuclear reactor with vertical channels, the discharge is often effected from the top of the reactor, the fuel elements being taken away from the channels and loaded into a discharging machine movable on the charging floor situated above the reactor. During these operations the axis of the fuel element remains nearly vertical. As a rule, these elements are then charged from this discharging machine into a transport container. According to this patent, the fuel elements have their axes horizontal as they are placed in this container. To this end, a handling device is provided comprising a container able to accommodate the elements. The container is pivotally mounted and can occupy a vertical position when the fuel elements are to be received from above and a horizontal position when they are to be released and to fall down into the said transport container. Suitably, the container has articulated parts, so that the bottom is closed when the container is turned up to receive the fuel elements, and is opened by cam devices during the last stage of the movement of the container into a horizontal position. (NSA, 1962, #5453)

106. IMPROVEMENTS RELATING TO NUCLEAR REACTORS, IN PARTICULAR TO HOMOGENEOUS GAS COOLED REACTORS

September 13, 1960

U.S. Department of Commerce, Washington, D.C.  
French Patent 1,230,018 (assigned to Société d'Exploitation des Matériels Hispano-Suiza)

A means is described for charging or discharging the fuel elements in a homogeneous gas cooled reactor. The vertical reactor channels are grouped, so that each group is served by a charging arm reaching any channel of the group. Each of these charging arms is positioned in a vertical tubular charging chute passing through the biological shielding situated above the reactor vessel and through the pressure vessel wall. This arm is connected above the shield to a remote-control head enclosing means for controlling the different movements of the arm. The head is removable so that it can be connected with any one of the charging arms. A second shielding is placed above the space within which the head can move, this shielding being provided with openings in alignment with the different lower charging chutes, upper charging chutes passing through these openings. The remote-control heat container is gas tight and able to withstand the same working pressure as the reactor pressure vessel, which is in communication with the container. (NSA, 1961, #32,963)

107. REPAIR OF DAMAGED SM-1 CONTROL ROD END CAPS

Hoffman, T. J.

October 11, 1960

Army Engineer Reactors Group, Fort Belvoir, Va.

OSB-6

AD-265,580

During rearrangement of the fuel elements in the SM-1 core, four control rod end caps were damaged because of improper removal procedures. Further unavoidable damage to the end caps occurred in subsequent removal operations. Because of the long lead time necessary to obtain new caps and also because of the large cost involved, it was decided to repair the damaged parts at Fort Belvoir, Virginia. A water shield tank and remote handling tools were fabricated, the control caps were disassembled, damaged parts were replaced with locally fabricated substitutes, and the reassembled units were put back into service. All work was successfully accomplished without subjecting personnel to dangerous radiation. (NSA, 1962, #18,662)

108. MECHANICAL MANIPULATOR TYPE M22

Kolář, M., Řína, K.

*Jaderná energie*, v. 6, pp. 21-22, 1960  
(in Czechoslovakian)

The new mechanical manipulator, constructed according to the specifications of the Soviet Type M22 unit, is suitable for handling radioactive solutions in a hot cell. It is capable of eight different movements. The height of its telescopic movement is 550 mm; the maximum left-to-right swing 85 deg; the rotation of the telescope 135 deg; the movement of the guidance and control mechanism from the operator 115 deg and to the operator 60 deg. The load limit for the raising and placing tube and pincers is 15 kg, while the maximum load for the swinging tube is 8 kg. Additional exchangeable pincers and a series of wrenches are available for opening tubes. (NSA, 1960, #19,071)

109. TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, SAN FRANCISCO, DECEMBER 11-15, 1960

Ward, F., Editor

*American Nuclear Society, Transactions of the*, v. 3, no. 2, 1960

Summaries are given of the 352 papers presented at the December meeting. Sessions were held on critical experiments, computer codes and numerical analysis, nuclear engineering education, shielding, radiation chemistry, fuel reprocessing and waste handling, reactor resonance physics, reactor mathematics, fuel element engineering, nuclear rockets, hot cells and laboratories, reactor theory and fuel cycles, reactor engineering, analysis, subcritical and reactivity experiments, safeguards, reactor dynamics, metallurgy and fuel manufacturing, isotope applications, instrumentation, neutron physics, heat transfer and fluid flow, manipulators and viewing, neutron thermalization and spectra, reactor physics analysis, reactor operations, theoretical physics, chemistry of nuclear reactor systems, experimental physics, radiation effects, waste management and disposal, remote reactors and reactor concepts, and glovebox and specialized equipment design. Subject and author indexes for both Vol. 3, No. 1, and Vol. 3, No. 2, are included. (NSA, 1960, #25,116)

110. PROCEEDINGS OF THE EIGHTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT, SAN FRANCISCO, CALIFORNIA, DECEMBER 13-15, 1960

American Nuclear Society, Chicago, Ill.  
(Obtainable as TID-7599, U.S. Dept. of

Commerce, Office of Technical Services,  
Washington, D.C.)

Fifty-two papers presented at the Eighth Conference on Hot Laboratories and Equipment, held at San Francisco, California, December 13 to 15, 1960, are given. The papers are grouped under the following headings: hot laboratory facilities and hot cells; general purpose manipulators and viewing; shielding and experiments; and glovebox design and specialized equipment. (NSA, 1961, #4803)

**111. THE DESIGN AND CONSTRUCTION OF THE SITE 401 DISASSEMBLY FACILITY**

Moran, W. H.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 1-12

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The design and construction of the Site 401 Disassembly Facility are described. A wide variety of considerations had to be made in the design from both construction and operation viewpoints. Some of the considerations discussed are shielding, ventilation, manipulators, versatility, and operation, as well as an over-all description of the facility. (NSA, 1961, #4809)

**112. HOT-AREA CONCEPT FOR RADIATION TEST FACILITIES**

Colp, J. L.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 13-23

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

Development of the hot-area concept required parallel development of a means of remotely moving radioactive objects about the area. This requirement led to the construction of a robot mobile remote handler equipped with two mechanical arms and two television camera eyes. A robot fork truck and robot radio-controlled tug are also used. In addition to lower costs of construction and operation, the hot area offers distinct advantages of

convenience, flexibility, and safety over conventional hot-cell plans. (NSA, 1961, #11,106)

**113. OPERATIONS IN THE HIGH ACTIVITY HANDLING BUILDING, B.459, ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL**

Bown, J. E., Ritchie, A. B.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 50-72

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The High Activity Handling Building (B.459) is a general purpose handling facility in operation since January 1958. The facility is concerned with a wide variety of work such as dismantling of in-pile loops, fuel-element examination, and precision machining of mechanical test specimens. Special machine tools for hot-cell use were designed and constructed. Further development is proceeding. The equipment, operational difficulties, and the problems of contamination control and productivity are discussed. (NSA, 1961, #4812)

**114. AN ALPHA BETA GAMMA METALLURGY CELL AT DOUNREAY**

Cottrell, S. A., Manson, J. E.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 73-77

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A small facility was built at Dounreay to handle irradiated fuels with activities up to the 100-Mev-curie level. The main feature is that the cell contains a 10-ft D rotating table which carries most of the equipment and delivers it to the operating position at the front of the cell or the maintenance port at the rear. A large glass window gives a view of the whole cell and master slave manipulators are used. The cell atmosphere can be chosen to suit the requirements and is filtered, recirculated, and purified. Maintenance or personnel entry is at the rear of the cell via a shower area leading to a steel door covering the access panel. The cell is at present used for metallography, density measurements, and heat treatment. (NSA, 1961, #4813)

**115. THE GENERAL ATOMIC  
HOT CELL FACILITY**

Brown, F. L., Bailey, L., Turovlin, B.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 101-114

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The General Atomic Hot Cell Facility contains two small kilocurie cells and one large megacurie cell in an arrangement which provides the equivalent of four or five small cells for capsule examinations while retaining the space required for handling full-size reactor components. Handling and operating equipment is designed to permit remote installation in the large cell so that equipment changes can be made without disturbing the progress of other operations in the same cell. Cell space and equipment are provided for decanning and machining operations, mechanical testing, and metallographic preparation and examination. (NSA, 1961, #4816)

**116. A COMPACT MOBILE MANIPULATOR**

Brown, J. A., Koelsch, W. A., Jr.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 224-229

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A compact mobile slave unit consisting of an articulated arm and hand mounted on a self-propelled dolly is described. Both the arm and the dolly are powered by dc motors supplied from a simple transistor power unit through a trailing cable. Control is effected by varying the voltage and polarity from a remotely located control box. The manipulator can carry out generalized manual operations in uninhabitable areas. It can enter and leave under remote control, and so can serve a number of alternate areas without special installation. (NSA, 1961, #4827)

**117. HINGED ARM POLAR MANIPULATOR  
POSITIONER MOUNTED ON A RADIO  
CONTROLLED MOBILE BASE**

Mohr, W. C., Youngquist, C. H.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 230-238

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A manipulative system that is an attempt to bridge the gap between presently available systems and the more sophisticated robot manipulators of the future is described. The manipulator positioner provides a volume of manipulative coverage comparable to a bridge mounted telescoping tube assembly. The mobile base is battery powered, radio controlled, and guided by rails set in the floor. These features allow the mobile base to carry the manipulator and positioner between cells unencumbered by power or control cables. (NASA, 1961, #4828)

**118. A RADIATION STABLE HEAVY DUTY  
ELECTROMECHANICAL MANIPULATOR**

Graae, J. E. A., Hampson, D. C., Pollack, I., Levenson, M., Schraadt, J. H., Bernstein, G. J.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 239-251

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The development of pyrometallurgical processes for purifying spent reactor fuels emphasized the need for a high-capacity (750-lb lift) radiation-stable manipulator. No existing manipulator appeared capable of functioning in a sealed area for more than a few hundred hours under the sustained radiation levels of  $10^4$  to  $10^6$  r/hr, which are anticipated. Therefore, it was necessary to design a manipulator which could operate for a long period in the sealed high-radiation-level process cells. A prototype manipulator operated successfully under an extensive testing program in a full-scale mockup facility. (NSA, 1961, #4829)

**119. AN ELECTROHYDRAULIC BILATERAL  
SERVOMANIPULATOR**

Mosher, R. S.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 252-262

American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A heavy-duty bilateral manipulator was constructed for an industrial nuclear engineering laboratory. Several note-

worthy design features provide unusual strength and dexterity. However, problems of cost and complexity indicate that considerable effort is needed to adapt this device to a broader range of applications. (NSA, 1961, #4830)

120. MECHANICAL DEJACKETING OF SRE FUEL  
Watson, C. D., West, G. A., Schaffer, W. F.,  
Klima, B. B., Adams, J. B.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 337-357  
American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

Equipment to mechanically disassemble, dejacket, and recan spent SRE fuel was designed, fabricated, and installed in a shielded segmenting facility at Oak Ridge National Laboratory. Remote performance testing of the equipment with unirradiated fuels showed that all operations are feasible. It is expected that irradiated fuel will be processed at a rate of 250 to 500 kg of uranium per day. Mechanical processing of spent fuel should begin early in 1961. (NSA, 1961, #4837)

121. REMOTELY CONTROLLED HOT STORAGE CELL FOR HIGH-LEVEL RADIOACTIVE SAMPLES  
Boehme, G.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 403-410  
American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A hot storage cell was developed which may serve to store more than 1800 radioactive samples in compartment tubes under a steel plate. The tubes can be pulled out by means of a remotely controlled precision rectilinear hoist crane and driven in front of a lead glass window. Here they are charged or discharged by a master slave manipulator specially designed for this job. An exchangeable periscope serves for viewing purposes inside the cell and in the storage area beneath the steel plate, which cannot be accomplished through the lead glass window. (NSA, 1961, #4843)

122. REMOTE ASSEMBLY OF REPROCESSED FUEL SUBASSEMBLIES FOR EBR-II  
Olp, R. H.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 429-440  
American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

Remotely operated assembly equipment and procedures used in constructing reactor core subassemblies for the first core loading of the Experimental Breeder Reactor No. 2 are described. All this equipment was designed for totally remote operation, maintenance, and replacement in a radiation field of up to  $10^6$  r/hr, resulting from the reprocessing of spent reactor subassemblies. The operation of this remote equipment is controlled through an electrical programming console exterior to the cell and Argonne-type master-slave manipulators. (NSA, 1961, #4846)

123. MODIFICATION AND REPAIR OF THE HRE-2 CORE VESSEL  
Hise, E. C.

In "Proceedings of the Eighth Conference on Hot Laboratories and Equipment, San Francisco, Calif., December 13-15, 1960," pp. 464-474  
American Nuclear Society, Chicago, Ill.  
(Obtainable in TID-7599, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

In April 1958 and in January 1960, holes melted through the Zircaloy core vessel of the Homogeneous Reactor Experiment No. 2. Investigations were made to determine the cause of and possible cure for the failures. Tools were designed and developed to repair the damage and effect the cure. Under working conditions of extreme physical limitations and radiation hazard the core vessel was inspected, measured, and cleaned. The diffuser plates were removed with the aid of a miniature underwater heliarc cutting torch, a sample of the core wall was obtained for metallographic examination, and the holes were patched. (NSA, 1961, #4850)

124. NUCLEAR REMOTE HANDLING EQUIPMENT

*The Engineer*, v. 210, p. 1010, December 16, 1960

125. DESCRIPTION AND OPERATION OF A UNIVERSAL ADAPTOR FOR GENERAL MILLS AND MODEL 8 MANIPULATORS

Di Rito, V. L. J.

December 1960

Wright Air Development Division, Flight and Engineering Test Group, Wright-Patterson AFB, Ohio

WADD-TN-60-305

An investigation to develop a device which would permit interchangeable power tools for the Model 8 and General Mills manipulators is described. A universal adaptor was developed that can be attached permanently to the tools used in a hot cell. The design of the universal adaptor and the modifications to the manipulators needed to make them capable of receiving the adaptors are described. (NSA, 1961, #22,398)

126. CABEZAL AUTOMÁTICO PARA TRASLADO DE MUESTRAS IRRADIADAS (DEVICE FOR AUTOMATIC TRANSFER OF IRRADIATED SAMPLES)

Spinadel, E.

1960

Comision Nacional de Energia Atomica,  
Buenos Aires, Argentina

Report 40, NP-10,362

A device for moving irradiated samples, samples to be irradiated, or radioactive materials from storage to the irradiation facility or vice versa is described. The apparatus, a sketch of which is given, is operated electrically by remote control. (NSA, 1961, #27,715)

127. EXPERIENCE WITH VIBRATORY POLISHERS AND DESIGN FOR HOT-CELL APPLICATION

Long, E. L., Jr., Meador, J. T., Gray, R. J.

In "Symposium on Methods of Metallographic Specimen Preparation (1960). Special Technical Publication No. 285," pp. 79-89

American Society for Testing Materials,  
Philadelphia, Pa.

... Plans were made for adaptation to remote operation, based on past experience with the vibratory polishers in the "cold" laboratory and several features unique to the polishers. Several necessary design changes were made

which in turn had to be compensated in the vibratory system to maintain proper polishing action. To complement the remoted polishers a new specimen holder was designed which allows easy insertion and removal of the specimens using master slave type manipulators. (NSA, 1961, #23,854)

128. CONSTRUCTION D'UNE ENCEINTE POUR LA MANIPULATION D'UN KILOCURIE D'EMETTEURS GAMMA (BUILDING OF A FACILITY FOR THE HANDLING OF KILOCURIE AMOUNTS OF GAMMA EMITTERS)

Germond, Ph.

1960

Commissariat à l'Énergie Atomique, Centre d'Études Nucléaires, Saclay, France

CEA-1378, available through U.S. Atomic Energy Commission, Rockville, Md.

(See also "Proceeding of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 71-80, American Society of Mechanical Engineers, New York, N.Y.)

A hot cell designed to handle up to 1,000 curies of cobalt-60 has been built in a pre-existing shielded room in order to make optimum use of available space. Heavy containers can be rolled in or out of the cell. Handling is performed with two manipulators designed and made by French manufacturers. One of them is pneumatically operated and the other one is mechanical. The general shape of the facility is that of an L. (NSA, 1960, #20,705)

129. REMOTE-HANDLING EQUIPMENT CATALOG

Ridgeway, C. L.

February 1961

General Electric Co., Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio

XDC-61-1-133, AF33(600)-38062, AT(11-1)-171

(Obtainable as TID-12752, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A reference catalog of remote-handling equipment at the Idaho Test Station is presented. Equipment design descriptions are included for special purposes related to reactor power plant assemblies shielding, cores, instrumentation and control, turbomachinery, and auxiliary equipment. (NSA, 1961, #18,168)

**130. MANIPULATOR FOR SLAVE ROBOT**

Goertz, R. C., Grimson, J. H., Kohut, F. A.

April 4, 1961

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,978,118 (assigned to U.S. Atomic Energy Commission, Rockville, Md.)

A remote-control manipulator comprising two stationary master units, two slave units on a movable vehicle, and electrical connections between the master and slave units is reported. The slave units are side by side with a minimum over-all width, which is made feasible by an arrangement of transducers producing most movements of each slave unit to one side of the support of said slave unit. (NSA, 1961, #13,140)

**131. IMPROVEMENTS IN OR RELATING TO SERVICING EQUIPMENT FOR NUCLEAR REACTORS**

Tait, R., Hall, R. H., MacFarlane, C. J.

April 26, 1961

U.S. Department of Commerce, Washington, D.C.

British Patent 866,301 (assigned to United Kingdom Atomic Energy Authority)

Equipment for servicing a nuclear reactor is described. It comprises a television camera of elongate form contained within a casing, a tool holder rotatable within the casing in front of the camera, and means passing between the casing and the camera for rotating the tool holder and for operating tools adapted to be fitted in the holder. The tool holder is rotated by an electric motor. A mechanical couple connects the tool holder with the motor. The camera and casing derive their driving power from a flexible cable; the cables are bunched together and pass out of the casing in a single flexible sheath so that the equipment can be lowered and raised from a winding drum. The operating tool consists of a hook and guide diametrically opposed. Another tool consists of a two-arm grab spring-loaded tool to close and open by a cable passing between the casing and the camera. (NSA, 1961, #21,812)

**132. IMPROVEMENTS IN OR RELATING TO REMOTE-HANDLING MANIPULATORS FOR RADIOACTIVE SUBSTANCES**

Howarth, A. J., Jones, F., Wortley, G.

May 3, 1961

U.S. Department of Commerce, Washington, D.C.

British Patent 867,297 (assigned to United Kingdom Atomic Energy Authority)

A relatively simple and inexpensive remote-handling manipulator, which is suitable for use with shielding walls of lead or other materials exceeding 4 in. in thickness, is described. The manipulator is comprised of a cubicle having shielding walls, a carriage movable on rails in an elevated narrow horizontal slot in one of the shielding walls, a framework mounted on the carriage so as to allow movement transverse to the carriage movement, and handling equipment supported by the framework. The handling equipment is operated by a "Bowden" cable controlled by means outside the cubicle. The handling equipment is also attached to a vertically disposed framework that is also operated from outside the cubicle. Releasable braking is used to hold the carriage and the framework in any desired position. A supply trolley may be fixed to the roof of the cubicle and linked to the carriage so as to follow the movement of the carriage. Substances for treatment and examination may be moved along the length of the cubicle by a rail system. (NSA, 1961, #18,179)

**133. IMPROVEMENTS IN DEVICES FOR INTRODUCING ELEMENTS, AND IN PARTICULAR FUEL RODS INTO NUCLEAR REACTORS AND/OR FOR WITHDRAWING SUCH ELEMENTS FROM SAID REACTORS**

Martin, R., Moulin, M.

May 31, 1961

U.S. Department of Commerce, Washington, D.C.

British Patent 869,539 (assigned to Commissariat à l'Énergie Atomique)

A device for introducing or withdrawing fuel elements from channels in the core of a nuclear reactor is described. The device consists of at least one movable mounted tubular arm; one end is adapted to register within the casing with the free ends extending from the core. The tubes form extensions to the various channels and are shaped so that their free ends define a part-spherical surface which is concave toward the tubular arm. Portions of the length of the tubes are adjacent to the free ends and extend radially off the surface for the passage of elements between the arm and the tubes. The arm is mounted for turning movement about two axes which intersect at the center of curvature of the part-spherical surface; one is fixed and is the geometric axis of the surface. Methods are described for observing the move-

ment of the fuel elements, and a light source and light detecting prism are also described for viewing. Mechanical equipment for the device is also described. (NSA, 1961, #21,819)

134. NUCLEAR INSTRUMENTATION

Raleigh, H. D., Scott, R. L., Compilers  
May 1961

Atomic Energy Commission, Office of Technical Information Service Extension, Rockville, Md.  
Literature Search  
(Obtainable as TID 3550, Rev. 1, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

This bibliography includes 1,728 references on the design, construction, and application of instruments for radioactive environments. Radiation detection instruments comprise the major portion of the references. Reports held by the Office of Technical Information Extension as of April 15, 1961, and references to journal articles which appear in *Nuclear Science Abstracts* are included. The references are arranged in the following categories: general, absorptiometers, air monitoring, amplifiers, betatron, bubble chambers, Cherenkov detectors, cloud chambers, coincidence counters, conferences, corrosion loops, dosimeters, electrostatic analyzers, fission chambers, Geiger counters, hot cells, in-pile loops, ionization chambers, liquid level gages, magnetic recording systems, nuclear emulsion analyzers, nuclear test aircraft, proportional counters, pulse analyzers, pulse generators, radiation detection instruments, radiochemical processing plants, radiological defense, radiological telemetering systems, reactors, remote-control equipment, scalers, scintillation detectors, spectrometers, and thickness gages. Within each category, the report references are arranged alphabetically by report number followed by an alphabetical listing of the journal references by title. (NSA, 1961, #22,459)

135. FORCE MULTIPLIER FOR USE WITH MASTER SLAVES

Miles, L. E., Parsons, T. C., Howe, P. W.  
June 2, 1961  
California, University of, Lawrence Radiation Lab., Berkeley  
UCRL 9662, W-7405-eng-48

A force multiplier was designed. This piece of equipment was made to increase the gripping force presently available in the Model-8 master slave. The force multi-

plier described incorporates a clamp which can be quickly attached to and detached from the master-slave handle. (NSA, 1961, #30,796)

136. IMPROVEMENTS IN MACHINES FOR HANDLING OBJECTS, SUCH AS FUEL ELEMENTS, THAT ARE USED IN THE FUEL CHANNELS OF NUCLEAR REACTORS

Langdon, K. T. P.

June 7, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 869,832 (assigned to Babcock & Wilcox, Ltd.)

A machine for handling objects, such as fuel elements, that are used in the fuel channels of a gas-cooled reactor and which may be adapted, having regard to its size, to provide an improved capacity, is described. It is used in charging or discharging fuel elements from a reactor. The machine includes: (1) a magazine provided with a number of chambers arranged in a plurality of circular series disposed so that a part of any series lies within another; (2) a housing containing the magazine; (3) guides for moving objects along a predetermined path into and out of the housing and the chambers of the magazine; and (4) means for rotating the magazine and moving the magazine laterally relatively to the housing so that the chambers can be brought sequentially into the predetermined path. (NSA, 1961, #21,825)

137. ENGINEERING CONSIDERATIONS FOR REMOTE REFABRICATION OF EBR-II FUEL ELEMENTS

Shuck, A. B., Ayer, J. E.

*American Nuclear Society, Transactions of the*, v. 4, no. 1, pp. 117-118, June 1961

138. EQUIPMENT FOR REMOTE INJECTION CASTING OF EBR-II FUEL

Jelinek, H. F., Iverson, G. M.

*American Nuclear Society, Transactions of the*, v. 4, no. 1, pp. 118-119, June 1961

139. EQUIPMENT FOR REMOTE DEMOLDING, SIZING, AND INSPECTION OF EBR-II CAST FUEL PINS

Carson, N. J., Jr., Brak, S. B.

*American Nuclear Society, Transactions of the*, v. 4, no. 1, pp. 119-120, June 1961

**140. REMOTE-CONTROLLED MANIPULATING APPARATUS FOR MANIPULATING OBJECTS INSIDE SEALED CHAMBERS**

July 26, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 873,441 (assigned to Commissariat à l'Energie Atomique)

A telemanipulator for manipulating objects inside a sealed chamber is designed which does not necessitate the creation of openings in the chamber walls. The apparatus comprises a first group of control units outside the chamber which actuates a second group of corresponding operating units inside the chamber. The connection between the groups is made by magnets superimposed on opposite sides of the chamber. (NSA, 1961, #24,934)

**141. A REMOTELY CONTROLLED MANIPULATOR**

August 2, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 874,104 (assigned to Vyzkumny a Zkusebni Letecky Ustav)

A remote-control manipulator for handling contaminated material is described. The manipulator consists of a handle mounted in universal suspension on a housing at one end of a supporting tube, wherein the supporting tube is mounted in and passes through a ball joint, which is carried in a protective wall of a contaminated space. The handle and the operating member are disposed without and within the space respectively. The handle carries a plate which is in contact with at least three pins, slidably mounted in the housing. The pins are in pressure contact through hydraulic means with the same number of additional pins which are slidably mounted in an additional housing and which are in contact with an additional plate carried by an operating member mounted in universal suspension on the additional housing at the other end of the supporting tube. The pins are formed as continuous rods with each end of the rods being in contact with one of the plates. The operating member carries a chuck jaw for manipulating purposes. (NSA, 1961, #27,727)

**142. IMPROVEMENTS IN OR RELATING TO APPARATUS FOR HANDLING RADIOACTIVE MATERIALS FOR USE IN CHARGING AND/OR DISCHARGING A VESSEL SUCH AS THE PRESSURE VESSEL OF A NUCLEAR REACTOR**

Bellinger, R., Hutchinson, E. J., Shipley, W. H.

August 2, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 874,225 (assigned to Strachan & Henshaw, Ltd.)

An apparatus is described for handling radioactive materials in charging and/or discharging a reactor. The apparatus includes (1) a chamber having an outlet adapted to be detachably connected to an inlet of the vessel, (2) storage means in the chamber for charge material to be charged into or discharged from the vessel, (3) grab and hoist means within the chamber for handling the charge material, and (4) control means outside the chamber for controlling the grab and hoist. A charge guiding chute is included in the chamber for introducing the material. (NSA, 1961, #27,730)

**143. REMOTELY OPERATED MANIPULATOR**

Hutto, E. L.

August 15, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 2,996,330 (assigned to U.S. Atomic Energy Commission)

A manipulator is described for performing, within an entirely enclosed cell containing radioactive materials, various mechanical operations. A rod with flexible fingers is encompassed by a tubular sleeve shorter than the rod. Relative movement between the rod and sleeve causes the fingers to open and close. This relative movement is effected by relative movement of permanent magnets in magnetic coupling relation to magnetic followers affixed to the ends of the rod and sleeve. The rod and its sleeve may be moved as a unit axially or may be rotated by means of the magnetic couplings. The manipulator is enclosed within a tubular member which is flexibly sealed to an opening in the cell. (NSA, 1961, #24,939)

**144. IMPROVEMENTS IN OR RELATING TO TELEVISION VIEWING EQUIPMENT FOR NUCLEAR REACTORS**

Hall, R. H., Howard, G., Ovens, C. C.

August 16, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 875,376 (assigned to United Kingdom Atomic Energy Authority)

A television viewing facility is designed for remote examination of the internal structure of a reactor for servicing operations. The facility comprises a support

member with a movable arm and a television camera mounted on the arm. (NSA, 1961, #27,736)

**145. REMOTE-CONTROLLED MANIPULATING APPARATUS FOR MANIPULATING OBJECTS INSIDE SEALED CHAMBERS**

September 6, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 876,898 (assigned to Commissariat à l'Énergie Atomique)

An improved telemanipulator of the type described in British Patent No. 873,441 is given. Manipulation of objects inside a sealed chamber is effected by a magnet disposed outside the chamber coupled to a second magnet inside the chamber. In the improved telemanipulator, transmission of commands from the control arms actuated by the operator to the controlling external magnet is effected by means of electric cables. In this way, the telemanipulator is made easier to handle and less bulky. (NSA, 1961, #29,344)

**146. REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, AUGUST 1961**

September 15, 1961

Argonne National Laboratory, Lemont, Ill.  
ANL-6409, W-31-109-eng-38

Progress is reviewed on the following reactors: EBWR, Borax-V; ZPR-III; ZPR-VI; ZPR-IX; EBR-I, and EBR-II. A description of the master-slave electric manipulator is included.

**147. IMPROVEMENTS RELATING TO TELEVISION INSPECTION APPARATUS FOR NUCLEAR REACTORS**

Camac, G.

October 11, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 879,528 (assigned to A.E.I.—  
John Thompson Nuclear Energy Co., Ltd.)

An apparatus is designed for removing broken fuel element pieces from reactor channels under television supervision. The apparatus comprises a small television camera suspended by a flexible supply cable, mechanical handling devices mounted adjacent the camera underside, and spindles and motors for positioning and actuating the devices. The embodiment described is applicable to fuel channels having longitudinal guide grooves. (NSA, 1962, #305)

**148. APPARATUS FOR MICROSCOPIC EXAMINATION**

October 25, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 880,708 (assigned to C. Reichert Optische Werke Aktiengesellschaft)

A remotely controlled apparatus is designed for the microscopic examination of radioactive specimens. The apparatus comprises a microscope, an illuminating device, a viewing device, an objective changing device and control elements for operating the microscope. The microscope is mounted in a shielding chamber, but the illuminating and viewing devices are outside the chamber with two lens systems arranged to project the light onto the specimen and to project an image of the specimen onto the viewing device. (NSA, 1962, #3177)

**149. PROCEEDINGS OF THE NINTH CONFERENCE ON HOT LABORATORIES AND EQUIPMENT, CHICAGO, ILL., NOVEMBER 7-9, 1961**

Fields, P. R., Editor

American Nuclear Society, Chicago, Ill.

Papers presented at the Ninth Conference on Hot Laboratories and Equipment are given. (NSA, 1962, #3107)

**150. A NEW POSTIRRADIATION EXAMINATION LABORATORY AT THE OAK RIDGE NATIONAL LABORATORY**

Olsen, A. R.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 3-14

American Nuclear Society, Chicago, Ill.

A new postirradiation examination laboratory was constructed at the Oak Ridge National Laboratory. The facility will accommodate materials of extremely high-level alpha activity and kilocurie levels of gamma activity. Special provisions were included to facilitate the post-irradiation examination of materials being investigated for advanced reactor applications. The building arrangement, cell construction, and special features, designed to permit operations with complete containment and with essentially no personnel entry, are described. The remote installation and removal of equipment, storage of contaminated equipment, remote decontamination, and remote maintenance features of the facility are expected to

provide safer operation, increased cell utilization, and decreased operating costs. (NSA, 1962, #3108)

**151. GAS-TIGHT CELL AND MAGNETIC REMOTE CONTROLLED MANIPULATOR**

Desroche, M., Cherel, G.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 87-90

American Nuclear Society, Chicago, Ill.

A gas-tight cell equipped with a remote controlled magnetic manipulator, and shielded by 8 in. of cast iron is described. The design seems economic, as compared with units of conventional construction. This type of cell is considered suitable for manipulations in inert atmospheres (argon, helium, and nitrogen). (NSA, 1962, #3119)

**152. EXTENDED REACH MANIPULATOR**

Saunders, C. E.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 107-110

American Nuclear Society, Chicago, Ill.

A manipulator for general hot cell work is described that provides twice the stroke of present manipulators and three times the volume coverage. The development of this mechanism and the effects it will have on over-all hot cell design are discussed, from both an operational standpoint and that of the engineering design of future cells. (NSA, 1962, #3121)

**153. THE MOBOT MARK II REMOTE HANDLING SYSTEM**

Clark, J. W.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 111-120

American Nuclear Society, Chicago, Ill.

A mobile general-purpose handling system was built and operated. Intended primarily for use in regions completely inaccessible to personnel, the only communication between vehicle and operator is a three-conductor cable. The feasibility of such fully remote systems was conclusively demonstrated. The machine described is a first step in the development of equipment for operation in all hostile environments. An outline of the general theory of design for such systems is presented. (NSA, 1962, #3122)

**154. THE ANL MODEL 3 MASTER-SLAVE ELECTRIC MANIPULATOR—ITS DESIGN AND USE IN A CAVE**

Goertz, R. C., Blomgren, R. A., Grimson, J. H.,

Forster, G. A., Thompson, W. M., Kline, W. H.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 121-142

American Nuclear Society, Chicago, Ill.

Four ANL Model 3 Master-Slave Electric Manipulators are operating in the Chemical Engineering Senior Cave, Argonne National Laboratory. These manipulators have a load capacity of 50 lb for 15 min and 30 lb continuously. Master and slave arms are connected only by electrical cables. The master and slave arm assemblies are mounted on bridge and rail systems. The slave support system, together with the seven master-slave motions of the manipulator, make it possible for the tongs to reach any point within the cave. The manipulators have performed well and demonstrate several advantages over mechanically connected master-slave manipulators. (NSA, 1962, #3123)

**155. AN ELECTRONICALLY CONTROLLED SERVO-MANIPULATOR**

Barabaschi, S., Cammarata, S., Mancini, C., Pulacci, A., Roncaglia, F.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 143-153

American Nuclear Society, Chicago, Ill.

An electronic force-reflecting servomanipulator with a load capacity of 50 lb was constructed for nuclear industrial applications. The slave arms are mounted on a remotely controlled trolley to perform as a general-purpose robot. The design features provide a high degree of handling dexterity and safe performance. However, a considerable effort is needed to increase the reliability, reduce the cost and improve the remote maintenance of the servomanipulator. (NSA, 1962, #3124)

**156. TRANSISTORIZED SERVO SYSTEM FOR MASTER-SLAVE ELECTRIC MANIPULATORS**

Potts, C. W., Forster, G. A., Maschhoff, R. H.

In "Proceedings of the Ninth Conference on Hot Laboratories and Equipment, Chicago, Ill., November 7-9, 1961," pp. 154-160

American Nuclear Society, Chicago, Ill.

A transistorized, force-reflecting servo system was developed for 50-lb capacity master-slave electric manipulators. This system has several improvements over similarly-used vacuum tube systems. The system utilizes three-phase synchro excitation in a 6-kc positional data system to reduce the number of leads in the cables. Demodulator-modulator circuits are used to get relatively noise-free performance. A fail-safe circuit is included to set the brakes on the slave drive unit if an electrical failure occurs. The operating time at full capacity is extended by automatically increasing the power to the fixed fields of the servo-motors only when required. The maximum amplifier output is 320 w at 60 cycles. (NSA, 1962, #3125)

#### 157. REMOTE HANDLING

Morand, R. F., Gehring, R. R., Editors  
General Electric Co., Flight Propulsion Lab.  
Dept., Cincinnati, Ohio  
Comprehensive Technical Report, APEX-911,  
AF33(600)-38062, AT(11-1)-171

General purpose equipment and procedures are described which were developed for the remote handling of irradiated aircraft power plants and associated subassemblies. At reactor operating cells, the operating personnel was shielded and the cells unshielded. The separate facilities were about one mile apart, connected to a locomotive turntable by means of a four-rail track system. Remote handling devices utilized in dismantling and inspection of radioactive power plants included an overhead manipulator, four wall-track-mounted manipulators, several master slave manipulators, periscopes, a tube-loading machine, and a core-removal fixture. General-purpose equipment such as manipulators and overhead cranes were augmented with special purpose tooling to satisfy the specific needs of the various power plants. General viewing was by direct-viewing shielded windows along the walls of the hot shop. The Flight Engine Test Facility (FET) was built to handle irradiated power plants mounted in aircraft. A self-propelled, shielded cab with manipulators was developed for working in the FET on nuclear power plants shortly after they were shut down. Photographs of the equipment are included (NSA, 1962, #7624)

#### 158. "ELECTRIC HANDS" FOR HANDLING RADIOACTIVE MATERIAL

Sirazitdinov, B. G., Zubkov, D. I.

*Izvestiya Vysshikh Uchebnykh Zavedeniy,  
Priborostroyeniye*, v. 4, no. 3, pp. 34-46, 1961

A working model of a reversible servosystem constituting the basic element of an electromechanical manipulator for handling radioactive and chemical materials was developed. The aim in developing the system was to achieve a greater number of degrees of freedom than is possible with mechanical manipulators equipped with belt or gear drives. To make it possible for the operator to control the displacement of an object to be moved as well as the force exerted on the object, the system uses two separately excited dc motors (a driving motor and an actuating motor) whose armatures are connected in series. Mathematical relationships characterizing the performance of such a system take into account compensation of friction and of the moment of inertia by introducing into the system a signal proportional to the difference in the moments applied to it. Stability was achieved under various operating conditions. (NSA, 1962, #304)

#### 159. ENGINEERING CONSIDERATIONS FOR REMOTE REFABRICATION OF EBR-II FUEL ELEMENTS

Shuck, A. B., Ayer, J. E.  
*Nuclear Science and Engineering*, v. 12,  
pp. 398-404, March 1962  
(See also ANL-FGF-272, Argonne National  
Laboratory, Lemont, Ill.)

The development of remote-control methods for manufacturing EBR-II fuel elements is influenced by many interacting factors. Radiation levels within the process cell are predicted to range from  $10^3$  to  $10^7$  rad per hour. Radiation damage to organic lubricant, electrical insulations, elastic seals, and protective coatings precludes the use of many standard machine components. Heat generated in the fuel by absorbed radiation makes forced cooling necessary in many operations. Oxygen must be excluded from all operations in which the fuel is exposed. Equipment must be designed for remote maintenance and component replacement within the limitation of available manipulators. The EBR-II fuel consists of fission alloy pins, sodium-bonded in stainless steel tubes. Precision casting is chosen as the basis for refabricating the fuel pins. Remote-control equipment is developed to cast, assemble, and inspect the EBR-II fuel elements. Radiation resistant, plug-in machine components are developed to give reasonable life expectancy and to allow remote maintenance and replacement. (NSA, 1962, #12,685)

**160. EQUIPMENT FOR REMOTE INJECTION  
CASTING OF EBR-II FUEL**

Jelinek, H. F., Iverson, G. M.

*Nuclear Science and Engineering*, v. 12,  
pp. 405-411, March 1962

(See also ANL-FGF-273, Argonne National  
Laboratory, Lemont, Ill.)

Precision injection casting is a method suitable to produce semifinished fuel pins. It is adapted to the remote refabrication of EBR-II fuel. Inert gas pressure is used to force molten fuel alloy into thorium-coated, precision-bore, high silica glass molds. During EBR-II, Core I production, 16,000 fuel castings are produced in batches of 120, using an experimental injection casting furnace. The specified weight, diametral tolerance, surface finish, and internal soundness specifications are successfully met. Remote-control equipment is designed from experience gained during Core I production. (NSA, 1962, #12,686)

**161. EQUIPMENT FOR THE REMOTE  
DEMOLDING, SIZING, AND INSPECTION  
OF EBR-II CAST FUEL PINS**

Carson, N. J., Jr., Brak, S. B.

*Nuclear Science and Engineering*, v. 12,  
pp. 412-418, March 1962

A semi-automatic, radiation-resistant machine is developed for the remote manufacture and inspection of EBR-II fuel pins from injection castings. Castings are stripped from Vycor molds by a device that breaks the molds. Fuel pins are cut from castings by shearing and are inspected. An air gage, balance, length comparator, and eddy current probe provide progressive diameter, weight, length, and internal quality signals. These signals are fed into a computer that gives digital indications of

diameter, weight, length, volume, and density, plus an internal quality trace. The accuracy of diameter, weight, and length measurements are 0.0002 in., 0.1 gm, and 0.01 in., respectively. (NSA, 1962, #12,687)

**162. MANIPULATING APPARATUS**

Le Flem, L., les Bains, E., Jouin, J.

May 29, 1962

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 3,036,966 (assigned to Commissariat à  
l'Énergie Atomique)

An apparatus is designed to be placed opposite an irradiation channel in a reactor in order to carry out the operations of loading, unloading, and transferring the capsules by remote control. The apparatus comprises a protection block having a longitudinal channel provided with a slider, means for securing a graphite brick with cavities on this slider, an unloading pipe, a loading pipe, a transfer box with cavities aligned similarly to those of the graphite brick, and remote control means for removing capsules from the cavities of the brick. (NSA, 1962, #20,582)

**163. HANDLING RADIOACTIVE MATERIALS**

*Nuclear Engineering*, v. 7, pp. 224-238, June 1962

The techniques and equipment for handling radioactive materials in experimental facilities are described. Designs and characteristics are given for remote-controlled tongs and manipulators, glove box instruments, irradiation facilities, and a remote-controlled welding and cutting machine. Equipment specifications indicate manufacturer, model, capacity, movement, and other characteristics. (NSA, 1962, #20,897)

## ROVING VEHICLES AND STATIONARY STRUCTURES

### 164. ARCTIC AND SUBARCTIC TRANSPORTATION. A TENTATIVE BIBLIOGRAPHY

Schmidt, R. W.

June 1949 (declassified June 15, 1954)

Air University, Maxwell Air Force Base, Ala.

Bibliography

AD-55,700

This tentative bibliography includes 105 references.

The subject both point to the fact that building structures on permafrost have failed because the thermal balance between the cold ground and the building supports eventually became disturbed and thawing occurred. The principle of maintaining this thermal balance with a system of refrigerated piping was suggested by I. L. Winsow of Seattle. Tests conducted in the cold chamber of this Laboratory have been very encouraging and indicate that such a system is practical both on frozen ground and on ice. (ASTIA)

### 165. THE LUNAR BASE

#### Thompson, G. V. E.

*British Interplanetary Society, Journal of the,*  
v. 10, no. 2, p. 49, March 1951

After describing the advantages of establishing the lunar base, which would be constructed for the refueling and maintenance of spaceships, an appraisal is made of the likelihood of minerals suitable for the preparation of propellants being available on the Moon. Methods and plants for preparing various individual propellants, power generation, and auxiliary equipment necessary for the welfare of the staff, etc., are then discussed. Finally, the problem of the establishment of the base is considered. 22 references. (LP, #795)

### 167. ANALYSIS OF DATA PERTAINING TO ARCTIC CONSTRUCTION

January 1956

Southwest Research Institute, San Antonio, Tex.

Report, AF 33(600)-31484

AD-93,718

Results are presented of investigations of environmental conditions in arctic regions and their effects on all phases of shelter design. Observer teams visited the Alaskan and eastern sectors of the DEW (distant early warning) radar line for familiarization. Studies were made of structures, construction techniques, structural components, and building materials which are currently used in arctic regions; fire resistance, thermal insulation properties, and extreme-cold-weather performance were emphasized. Results demonstrate the advisability of doing as little outside work as possible at the site. The foundation is usually permafrost, which should be disturbed as little as possible. Buildings are best oriented if they present their narrowest dimension toward the prevailing wind. Wood is considered the best material for arctic construction, but as a result of the wide use of wood, severe fire hazards arise. Roofs are generally flat or nearly flat with no overhangs for minimizing snow accumulation and for equalizing roof loading. The most important control measure against condensation is the provision of a continuous vapor barrier at or near the interior surface of the building; metal was considered the best vapor-barrier material. Exterior doors should be rugged and open in; a flexible cover at the hinge jam is recommended. Vestibules should be heated and ventilated. Forced-warm-air heating is recommended. An evaluation is presented of the present DEW system structures. 652 references. (ASTIA)

### 166. A PROPOSED SYSTEM OF BUILDING CONSTRUCTION ON SNOW, ICE, AND PERMAFROST

Giles, S.

January 16, 1956

Naval Civil Engineering Research and Evaluation Lab., Port Hueneme, Calif.

Technical Note N-239

AD-108,246

Construction of buildings in northern climates where the ground is frozen all year round (permafrost) has been a difficult engineering problem. Building footings and pads, even when installed with thick insulation or on pilings, have eventually thawed the supporting ground, breaking down the building structure. The majority of each type of building constructed has failed within a few years. This investigation was undertaken to develop an economical method of constructing buildings on permafrost, ice, and snow. Field experience and literature on

168. MINUTES OF MEETING NO. 1 OF THE SCIENTIFIC ADVISORY COMMITTEE AT THE LAND LOCOMOTION RESEARCH LABORATORY

June 1956

Detroit Arsenal, Center Line, Mich.

Memorandum Report M01

AD-111,897

The following factors were highlighted at the meeting: The need for a definition of mobility is paramount. Before tactical mobility is defined, a concept of mechanical mobility should first be established. This can be done with the development of an applied mechanics of land locomotion. However, complete evaluation of mechanical mobility and design parameters appears impossible without an operational analysis of vehicle-terrain systems similar to that used in an evaluation of other engineering systems. The present development trends seem to have led to diminishing returns—too much effort on minor improvements, and too little on major advances. Conceptual studies of locomotion mechanics are as important today as technological studies of engines and transmissions. Balance in budgeting respective activities should be reconsidered. The start made by the Land Locomotion Research Laboratory in establishing new geometric-physical values of terrain and methods of mobility evaluation is acceptable as a basis for further development of research in vehicle mechanics. Laboratory facilities and organization, present and proposed, are adequate for the task. Continuity of research within the foreseeable future is mandatory as far as the final success is concerned. The first task of the Land Locomotion Research Laboratory is to establish a more scientific method of evaluation of vehicle performance and design parameters. Research should be separated from development at an appropriate level of management. Flexibility in the expansion and the development of research programs and facilities is essential for further progress. (ASTIA)

169. REPORT OF OPERATION DEEP FREEZE I, 1955-1956

October 1, 1956

United States Department of Defense, U. S. Navy

Task Force 43, Washington, D. C.

Report

This collection of dated entries gives information on the activities of approach, supply and cargo handling, exploration, equipment, construction, experimentation, and personnel morale. Subsequent reports in this series were published for the following fiscal years: 1956-1957,

1957-1958, 1958-1959, 1959-1960, 1960-1961, and 1961-1962.

170. LUNAR BASE STUDY JURY REPORT: EVALUATION OF AN EXPERIMENT IN CREATIVE DESIGN CONDUCTED WITH COLLEGE STUDENTS

Holbrook, R. D., Lang, H. A., Huntzicker, J. H.

January 1, 1958

Rand Corp., Santa Monica, Calif.

RM-2174

AD-205,422

A problem concerning the design of lunar facilities under the constraint that transported mass be minimized was posed to students. A course syllabus in the format of a Technical Program Planning Document was prepared and suitable background given. Students freely selected problems and worked on them individually. All submitted papers were examined. In the present memorandum the papers, the experiment, and the general feasibility of the approach are evaluated.

171. LUNAR BASE PLANNING CONSIDERATIONS

Holbrook, R. D.

February 24, 1958

Rand Corp., Santa Monica, Calif.

Paper 1436

This paper treats the type of operation implied by the concept of a lunar base, the surface conditions to be expected on the Moon, and planning factors for establishment of an independent base.

Various types of bases are discussed including a scientific base, a permanent base, and an exploration base.

Factors involved in the establishment of an independent base are as follows: ecology; general living arrangements; supply and renewal systems; air, food, and water; waste disposal; power; and activity. (AI/A, 1960, #2346)

172. CERTAIN ECOLOGICAL ASPECTS OF A CLOSED LUNAR BASE

Cooper, I., Lang, H. A., Holbrook, R. D.

March 6, 1958

Rand Corp., Santa Monica, Calif.

Paper 1304 (also presented at ARS meeting, Dallas, Texas, March 18, 1958)

The central problem here is to define the requirements for an ecological space for men, which could be utilized

on the Moon. A starting point for studying a problem of this kind is to determine the input requirements which will allow a man to live, in the full sense of the word, for one day. The implicit assumption is that the lunar base will be closed ecology with an environment not too different from that of our own Earth.

Representative examples of the biophysical data available for determining the requirements to sustain a man are presented. Beginning with these data, heat, air, water and food requirements can be determined, methods of waste disposal of gases, liquids and solids examined, and the process equipment available or required designed. (AI/A, 1960, #2429)

173. OUTLINE OF STUDY OF EXTRA-TERRESTRIAL BASE DESIGN

Holbrook, R. D.

April 22, 1958

Rand Corp., Santa Monica, Calif.

RM-2161, AF 33(038)-6413

AD-156,043

Requirements foreseen on various types of extraterrestrial bases are presented as well as the effect of design requirements on associated spaceflight systems. The example cited—the design for a lunar base—reviews the state of man's knowledge of the Moon, of rocket transport problems, and of experiments which should precede establishment of a lunar base. Discussions are also given of ecological problems, of base and support system design, of component hardware, and of planning for major activities. The growth of initial facilities by utilization of local materials, which is the essential problem of colonization, is also considered. The outline concludes with a listing of specific study topics for a research program and with a selective bibliography. 102 references. (LP, #634)

174. MOON LOOKS PROMISING AS A MANNED SPACE STATION

Stehling, K. R.

*Aviation Age*, v. 30, no. 5, pp. 22-23, 180, May 1958

(Abstracted in *Aero/Space Engineering*, v. 17, no. 8, p. 106, August 1958)

175. MARS, MOON BASES FORESEEN IN 20 YEARS

Stone, I.

*Aviation Week*, v. 68, no. 26, pp. 20-21, June 30, 1958

176. MOON REFUELING FOR INTERPLANETARY VEHICLES

Stehling, K. R.

*Aviation Age*, v. 30, no. 2, pp. 22-25, August 1958

177. POWER FOR A LUNAR COLONY

O'Day, M.

*Proceedings of Lunar and Planetary Colloquium*, v. 1, no. 3, pp. 11-14, October 29, 1958  
(Published by North American Aviation, Inc., Los Angeles, Calif.)

The Colloquium was held in July 1958 at Santa Monica, California.

178. A PROPOSAL FOR A VILLAGE ON THE MOON

Kumagai, H.

*Space Journal*, v. 1, no. 4, p. 41, Fall 1958

179. ANALOG STUDY OF LEVAPAD STABILITY

Jay, D. J., Peithman, H. W.

American Society of Mechanical Engineers, New York, N.Y.

Paper 58-A-287, presented at ASME meeting, New York, N. Y., November 30-December 5, 1958

The levapad method is a system for supporting a vehicle above a rail or roadway on film of pressurized air. The basic support device is air lubricated slider bearing. A set of nonlinear differential equations is derived to describe self-excited vibration of early levapad type. This study demonstrated how the system might be designed to eliminate vibration. (EI, 1959)

180. THE MOON AND INTERPLANETARY SPACE FLIGHTS

Sharonov, V.

*Izvestiya* (USSR), no. 28, p. 4, columns 1-5, 1958  
(Abstracted in *Technical Translations*, v. 2, no. 11, p. 760, December 4, 1959)  
(Available from Library of Congress or Special Libraries Association, 59-22199, Washington, D.C.)

This article states that the Moon will become a populated world, and that it will be the first station on the road to the conquest of the solar system. (AI/S, 1960, #20,249)

181. DESIGNERS STUDY AIR CUSHION PRINCIPLES FOR VEHICLES

Butz, J., Jr.

*Aviation Week*, v. 70, pp. 74-75, January 12, 1959

182. EQUIPMENT FOR MANNED SPACE CAPSULES AND LUNAR BASES  
Gerathewohl, S. J.  
February 28, 1959  
Army Medical Research Lab., Fort Knox, Ky.  
Special Report  
AD-227,226

The construction of second- and third-generation boosters developing several million pounds of thrust leads to manned space flight. This not only requires the advancement of engineering capabilities and space technology, but also demands an acceleration of bioastronautical research and the projection of information already available into the region of outer space. Equipment variables which are thought to be significant for man's exploration and survival in space are discussed, and sets of research tasks necessary for the accomplishment of manned space missions are proposed. 31 references. (ASTIA)

183. SAUNDERS-ROE STUDIES DUETED FAN VEHICLE: HOVERCRAFT  
*Aviation Week*, v. 70, pp. 32-33, April 27, 1959

184. POTENTIAL OF GROUND EFFECT VEHICLES STUDIED BY DEFENSE DEPARTMENT  
*Aviation Week*, v. 70, pp. 89-94, April 27, 1959

185. ELECTRIC POWER FOR LUNAR STATIONS  
Hiltner, W., Oman, H.  
Paper presented at Astronomical Society of the Pacific Meeting, San Francisco, Calif., June 17-18, 1959  
(Abstracted in *Publications of the Astronomical Society of the Pacific*, v. 71, no. 422, p. 386, October 1959)

The first manned exploratory stations that stay on the Moon for a few days or weeks will probably have fuel cells as a power source. Small stations will probably use solar power, but large permanent installations will derive their energy from nuclear sources. (AI/S, 1960, #20,248)

186. OVER LAND OR SEA: HOVERCRAFT  
*Time*, v. 73, p. 40, June 22, 1959

187. PROTOTYPE HOVERCRAFT TESTED ON WATER  
*Aviation Week*, v. 70, pp. 64, 67-68, June 29, 1959

188. CURTISS-WRIGHT TESTS AIR-CAR PROTOTYPE  
Bulban, E. J.  
*Aviation Week*, v. 71, pp. 115-116, July 6, 1959

189. TURBINE IMPROVES VZ-8P PERFORMANCE: PHOTOGRAPH  
*Aviation Week*, v. 71, p. 129, July 13, 1959

190. CARS WITHOUT WHEELS  
Mann, M.  
*Popular Science*, v. 175, pp. 51-55, July 1959

191. LOCOMOTING ON A BUBBLE OF AIR  
*Business Week*, pp. 34-35, August 1, 1959

192. HOVERCRAFT AND AIR CUSHION PRINCIPLE  
*Aircraft Engineering*, v. 31, no. 366, August 1959

A summary is given of work done on the SRN-1 experimental vehicle, built by Hovercraft Development, Ltd., and Saunders-Roe, Ltd. Included are the basic principle of the machine (machine is kept airborne on a cushion of air established and retained by a "curtain" jet issuing from a slit nozzle round its periphery) and model tests. The existing full scale vehicle is 30 ft long by 24 ft wide, weighs 7500 lb, and is powered by 435 hp Alvis Leonides, which drives a four-bladed fan. (EI, 1959)

193. THE MEN ON THE MOON  
Hiltner, W., Oman, H.  
*Boeing Magazine*, v. 29, no. 8, pp. 6-7, August 1959

194. GEOPHYSICS AS APPLIED TO LUNAR EXPLORATION  
Green, J.  
September 14, 1959  
North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.  
QSR 1, MD 59-277, AF 19(604)-5886

The scope of the study is presented.

195. AIR CUSHION VEHICLE DESIGN FOR MARINES  
*Aviation Week*, v. 71, pp. 87-88,  
September 21, 1959

196. BIBLIOGRAPHY LAND LOCOMOTION

van Kooten, W. C.

September 11, 1959

Technisch Documentatie en Informatie Centrum  
voor de Krijgsmacht, Netherlands

Report TDCK 18934

AD-233,553

Tracked, wheeled, and sliding vehicles are considered as well as the trafficability of soils. 62 references.

197. CARS FOR EVERY GROUND

Ley, W. A.

*Senior Scholastic*, v. 75, pp. 18-19, October 14, 1959

198. BASIC DESIGN CRITERIA FOR MOON  
BUILDING

Rinehart, J. S.

*British Interplanetary Society, Journal of the*, v. 17,  
no. 5, pp. 126-129, September-October, 1959

The environmental conditions which will be encountered on the Moon and their effect on the design of buildings for lunar use are discussed. Diversity in materials, forms, and structural types is pointed out. Inflatable plastic balloon shelters for temporary use and aluminum structures for more permanent buildings are suggested.

199. ELECTRIC DRIVES ARE PRACTICAL  
FOR OFF-HIGHWAY VEHICLES

McLean, H. J., Vitt, H.

*SAE Journal*, v. 67, pp. 28-32, October 1959

200. TESTS INDICATE BRIGHT FUTURE FOR  
AIR SLEDS

*Popular Mechanics*, v. 112, p. 119, October 1959

201. HIPPO: CURTISS-WRIGHT AIR-CAR

*New Yorker*, v. 35, pp. 41-43, November 21, 1959

202. GEOPHYSICS AS APPLIED TO LUNAR  
EXPLORATION

Green, J.

December 15, 1959

North American Aviation, Inc., Space and  
Information Systems Div., Downey, Calif.  
QSR 2, MD 60-203, AF 19(604)-5886

The interpretation of geophysical data relating to lunar exploration is considered in relation to specific instrumentation-vehicle combinations embodying geophysical data

and principles from the literature. The scope of investigation is defined by existing hardware. The most important consideration is that there should be a valid geophysical reason for the need of the measurement.

203. THE MOON CAR

Oberth, H.

Ley, W., Translator

Harper & Brothers, New York, N. Y., 1959

(Translated from "Das Mondauto," Econ-Verlag,  
GMBH, Dusseldorf, Germany, 1959)

204. TARGET FOR TOMORROW

Levitt, I. M.

Fleet Publishing Corp., New York, N. Y., 1959

205. COMPARATIVE COSTS OF NON-  
DESTRUCTIVE METHODS OF TRANSPORT-  
ING MATERIALS TO A LUNAR BASE

Cornog, R.

American Astronautical Society, Inc.,  
New York, N.Y.

Paper 60-58, presented at AAS Sixth National  
Annual Meeting, New York, N. Y.,  
January 18-21, 1960

Manned exploration of the Moon will begin within the next few years. It is also probable that the Moon will be the first objective beyond the Earth to be so explored. Sometime after these initial explorations, rather large quantities of material may be landed on the lunar surface, and construction of inhabited outposts started.

Since it is likely that upwards of several hundred tons (Earth mass) of material may be required to construct an adequate lunar base, it seems appropriate to investigate the most expedient and most economical method of transporting large quantities of payload material nondestructively from the surface of the Earth to the surface of the Moon. Accordingly, several methods of effecting such transportation have been investigated numerically. The results are presented in this paper. (LP, #211)

206. AIR SKOOTER, WHAT IT'S LIKE TO DRIVE

Arctander, E. H.

*Popular Science*, v. 176, pp. 134-135, January 1960

207. CROSSING THE CHANNEL WITHOUT A  
TUNNEL

*Engineering*, v. 189, p. 188, February 5, 1960

208. BIBLIOGRAPHY ON SNOW, ICE AND PERMAFROST, WITH ABSTRACTS  
January 1960  
Army Snow, Ice and Permafrost Research Establishment, Wilmette, Ill.  
SIPRE Report 12, Volume 14  
AD-255,775  
(See also SIPRE Report 12, Cumulative Index, Vol. 1-10, AD-116,598; SIPRE Report 12, Vol. 12, AD-158,195; SIPRE Report 12, Vol. 13, AD-217,715)

Trafficability, soils, construction, structures, and transportation are included as well as more general climatic features.

This bibliography is prepared on a continuing basis by the Science and Technology Division of the Library of Congress. The present volume is the fourteenth of a series begun in 1951. Volumes 1-5 were entitled "Annotated Bibliography on Snow, Ice, and Permafrost." Volumes 1-11 were issued semi-annually; thereafter publication has been annual. Each volume is an indexed cumulation of abstracts issued on standard catalog cards during the previous year.

209. IS THIS THE PERSONAL CAR OF THE FUTURE? WHEELLESS AUTO, THE LEVACAR MACH I  
*Corrosion*, v. 16, p. 39, February 1960
210. CAR WITHOUT WHEELS: EPOXY-LAMINATED PROTOTYPE MAKES TRIAL AIR-PROPULSION RUN; LEVACAR MACH I  
*Plastics World*, v. 18, p. 80, February 1960
211. THEY RIDE ON CUSHIONS OF AIR  
Manchester, H.  
*Reader's Digest*, v. 76, pp. 112-116, February 1960
212. FORD DESIGNING LEVACAR AS REPLACEMENT FOR RAILROAD  
MacDonald, D.  
*Product Engineering*, v. 31, pp. 16-17, March 7, 1960
213. GEOPHYSICS AS APPLIED TO LUNAR EXPLORATION  
Green, J.  
March 15, 1960  
North American Aviation, Inc., Space and

Information Systems Div., Downey, Calif.  
QSR 3, MD 60-99, AF 19(604)-5886

In this report, some of the methods for lunar exploration evolved in the first phase of the study are considered in detail, and an outline is given of specific instrumentation-vehicle combinations. The gross characteristics required of these combinations are stated, including sensitivity, time, space required, size, weight, and function.

214. POTENTIAL OF THE AIR-CUSHION VEHICLE  
Jackson, R. P., Southcote, M. F.  
*Aero/Space Engineering*, v. 19, pp. 40-47, 65, March 1960
215. SIX WAYS TO LIFT AN AIR CUSHION VEHICLE; ABSTRACTS OF THREE PAPERS  
*SAE Journal*, v. 68, pp. 27-29, March 1960
216. SYMPOSIUM SEEKS WAYS TO CUT GSE COSTS  
Means, P.  
*Missiles and Rockets*, v. 6, no. 13, pp. 37-38, April 4, 1960
217. VEHICLES FOR EXPLORATION ON MARS  
Cartaino, F. T.  
American Rocket Society, Inc., New York, N.Y.  
Paper 1090-60, presented at ARS Structural Design of Space Vehicles Conference, Santa Barbara, Calif., April 6-8, 1960

Types of vehicles are considered which might be employed for exploration on Mars after landings by manned expeditions. A wide spectrum of vehicle types is considered and the feasibility of designing such vehicles is investigated. Some operational aspects are looked at briefly. It is concluded that early explorations will probably be conducted on foot. For later expeditions, or when extensive exploration over long distances is desired, some form of powered vehicle will be required. (AI/A, 1960, #2543)

218. CRITERIA FOR METEOR PROTECTION  
Gemmell, R. A.  
American Rocket Society, Inc., New York, N.Y.  
Paper 1097-60, presented at ARS Structural Design  
of Space Vehicles Conference, Santa Barbara,  
Calif., April 6-8, 1960

This paper establishes some parameters required for protection of a manned base on the Moon. An investigation of meteor characteristics, impact, and damage has been performed, and construction methods for a lunar base have been studied. The parameters are considered as initial steps to establish the criteria for meteor protection of a lunar base. (AI/A, 1960, #2545)

219. GROUND-EFFECT MACHINES ARE  
PROMISING, BUT NEED LOTS MORE  
RESEARCH AND DEVELOPMENT  
*Product Engineering*, v. 31, pp. 15-17,  
April 25, 1960

220. PRELIMINARY FLIGHT EXPERIMENTS  
WITH THE PRINCETON UNIVERSITY  
20-FT. GROUND EFFECT MACHINE  
Nixen, M. B., Sweeney, T. E.  
*Aero/Space Engineering*, v. 19, pp. 32-36, 58,  
April 1960

221. LUNAR OBSERVATION SYSTEMS  
Jones, A. L., Wickham, P. L., Ryker, N. J.  
American Rocket Society, Inc., New York, N.Y.  
Paper 1197-60, presented at ARS Semi-Annual  
Meeting, Los Angeles, Calif., May 9-12, 1960

Design considerations, development techniques, and a development program for achieving a series of observatories on the Moon for astronomical and astrophysical research are presented. This series proceeds progressively from the installation of an unmanned remotely operated telescope to the first manned lunar vehicle with a telescope, and finally, to a reasonably complete observatory.

An approach in which the lunar data can be collected and the vehicle systems developed to provide a reliable lunar observatory system is described. (AI/A, 1960, #2788)

222. LIFE SUPPORT SYSTEMS FOR THE  
LUNAR BASE  
Gaume, J. G.  
American Rocket Society, Inc., New York, N.Y.  
Paper 1227-60, presented at ARS Semi-Annual  
Meeting, Los Angeles, Calif., May 9-12, 1960

Life support systems that would be required for lunar operations are briefly reviewed. One concept of a research laboratory and test facility designed specifically to develop and test the various subsystems and components of the regenerative life support system is discussed. Since much time is required to test the fully integrated system, an immediate beginning must be made to implement such a program. (AI/A, 1960, #2802)

223. CONCEPT STUDY LUNAR CONSTRUCTION  
RESEARCH FACILITY  
May 13, 1960  
Army Engineer Research and Development Labs.,  
Missile and Space Office, Fort Belvoir, Va.  
MSO 59-100

This report describes the proposed facility, the principal technical component of which is a 10-m-D stainless steel sphere, with entrance lock, in which the lunar environment is simulated in terms of pressure, solar radiation, and temperature. Supporting technical facilities required include a vacuum system to reduce the pressure to not more than  $10^{-6}$  mm Hg absolute, a 75 ton-per-day nitrogen liquefaction plant, and electrical equipment and instrumentation. (LP, #46)

224. AUTOMOTIVE DEVELOPMENT TRENDS  
IN THE USA  
Raviolo, V. G.  
*Engineering*, v. 189, p. 722, May 27, 1960

225. FILLING THE GAP BETWEEN THE SHIP  
AND THE AEROPLANE; THE GROUND-  
EFFECT MACHINE; EDITORIAL  
*Aircraft Engineering*, v. 32, p. 125, May 1960

226. GROUND-EFFECT MACHINES; CLASSIFI-  
CATION AND BASIC PRINCIPLES OF  
THE SIX MAIN CATEGORIES  
Boehler, G. D.  
*Aircraft Engineering*, v. 32, pp. 132-136, May 1960

227. NEW CONCEPT IN MARINE TRANSPORT  
Crewe, P. R., Eggington, W. J.  
*American Society of Naval Engineers, Inc.,  
Journal of the*, v. 72, pp. 303-306, May 1960

228. RIDING ON AIR  
Clarke, A. C.  
*Holiday*, v. 27, pp. 24-29, May 1960

229. TRANSPORT BY AIR TRAINS; LEVACARS  
*Science News Letters*, v. 77, p. 390, June 18, 1960

230. GEOPHYSICS AS APPLIED TO LUNAR EXPLORATION: FINAL REPORT

Green, J.  
June 30, 1960

North American Aviation, Inc., Space and Information Systems Div., Downey, Calif.  
MD 59-277, AFCRL-TR-60-409, AF 19(604)-5866  
AD-245,513

A survey of the recent geophysical literature was applied to lunar exploration. Simple combinations of already existing hardware were prescribed to perform specific geophysical tasks on four vehicles. Experiments and surveys were discussed and described for use in hovering, surface, and subsurface probes. For the hovering and surface surveys, certain morphological features of impacted and volcanic terrains were described. Emphasis was placed on caldera and lava plain features because of the advantages that volcanism offers over impact processes with regard to terrain and mineralization. Comparison curves of geophysical instruments over craters of the two opposing mechanisms of origin are compared. The two-curve magnetometer offers much in terrain analysis of the lunar surface. Instrumentation details of television and infrared surveying are detailed. A nested geophone and pulser define a possible system for both surface and subsurface seismic research. For surface and subsurface analysis, specific adaptations of conventional well-logging devices, both horizontal and vertical, are outlined with emphasis on the search for water.

Response telemetered from the prescribed instruments, particularly the resistivity log, may be better interpreted by recording during passage of the lunar shadow front. The dry-hole resistivity, neutron-neutron, density, and pulsed accelerator logs are described and endorsed. The pulsed accelerator neutron-gamma system is particularly suited for analysis of elements of high-neutron capture cross section such as boron, chlorine, and sulfur. These elements are enriched in soluble compounds in ocean water on Earth. If defluidization enriched these elements on the surface of the Earth, a similar defluidization process may have enriched them as fumarolic products on the Moon. However, mineralization, if it exists, will probably be concentrated in unknown amounts either in eternally shadowed zones or under dust. Nuclear spectroscopy of the neutron-gamma reaction type is amenable to volume analysis in distinction to surface analysis techniques and can provide an indication of the nature of the material in

fissures and under dust. Ice may conceivably be detected by this technique.

Four instrumented vehicles, two hovering and two soft-landed, are described for the performance of specific missions. For the *Atlas* hovering vehicle, available for 32½ min of hovering, 68 lb (30 kg) of instruments are detailed; for the *Saturn* hovering, available for 46 min of hovering, 131 lb (59 kg) of instruments are prescribed; for the *Atlas* soft-landed vehicle, 550 lb (247 kg) of instruments are described; and for the *Saturn* soft-landed, 1360 lb (617 kg) of instruments. The equipment common to all four vehicles includes television and infrared cameras and electronics, shift registers, encoders, analog-to-digital converters, programmers, command receivers and decoders, power supplies, telemeters, and wiring and structure. In addition to this common unit, the *Atlas* hovering contains a gamma-ray scintillometer, and two-curve magnetometer; the *Saturn* hovering contains the *Atlas* instruments plus a gravimeter, a mass spectrometer and a radar altimeter. Both surface vehicles contain the common unit just mentioned, together with a landing control programmer, instrumentation programmer, radioactive and sonic shielding, and electromagnetic devices for extender probes. The surface *Atlas* vehicle also contains a micrometeorite detector, discriminated gamma log, neutron-neutron log, resistivity log, temperature log, nested geophone, magnetometer, and density log. The *Saturn* surface vehicle contains all the *Atlas* instruments except the neutron-neutron log. In addition, the *Saturn* contains a pulser to accompany the geophone, proton-gamma and neutron-gamma accelerator log, mass spectrometer, drilling rig, lubricant, and batteries for drilling. The sites for location of these vehicles are detailed on a lunar map on which are specified geological and geophysical features of interest. 262 references. (AI/A, 1960, #3488)

231. V-STOLs AND GROUND EFFECT MACHINES; OBVIOUS POTENTIAL LIMITED SALES

Loebelson, R. M., Dawson, C.  
*Space/Aeronautics*, v. 33, pp. 43-46, June 1960

232. GROUND EFFECT MACHINES; STATE OF THE ART

de Biasi, V.  
*Space/Aeronautics*, v. 33, pp. 47-55, June 1960

233. ANNULAR JET GROUND EFFECT MACHINE

*The Engineer*, v. 210, p. 34, July 1, 1960

234. CUSHIONCRAFT; GROUND EFFECT IS DIRECT  
*Engineering*, v. 190, p. 14, July 1, 1960
235. SHIPS THAT SAIL ON AIR  
Cathers, L. D.  
*Machine Design*, v. 32, pp. 24-28, July 7, 1960
236. CUSHION CRAFT DESIGNED FOR RIVER TRAVEL  
Tunstall, J.  
*Aviation Week*, v. 73, pp. 113, 115, 117, July 11, 1960
237. DOWN TO THE SEA ON FILMS OF AIR  
*Compressed Air Magazine*, v. 65, p. 19, July 1960
238. THEY FLOAT ON THE AIR  
*New York Times Magazine*, pp. 96+, August 21, 1960
239. LEVACAR, VEHICLE OF THE FUTURE; ABSTRACT  
Haynes, A. L.  
*Electrical Engineering*, v. 79, pp. 709-710, August 1960
240. SKIRTING A HOT ROD; URETHANE ELASTOMER MATERIAL WINS OUT OVER RUBBER AS AIR-DIRECTING SKIRT OF CURTISS-WRIGHT'S AIR CAR  
*Plastics World*, v. 18, p. 32, August 1960
241. PROBLEMS OF CRAWLER TRACTOR DESIGN  
Little, L. F.  
*Civil Engineering*, v. 14, no. 8, pp. 393, 395, 397-400, August 1960
- An investigation of soils is made to ascertain their ability to sustain weight and tractive effort. Problems regarding application of soil-mechanics concepts to prediction of vehicle performance are discussed. The results of field experiments are given. Also discussed are requirements for tractive effort, grouser dimensions, load distribution, wheel load, torque performance, steering, engine life, and cooling considerations. (*EI*, 1961)
242. LEVACARS; WHY AND HOW?  
Haynes, A. L., Jay, D. J.  
*Mechanical Engineering*, v. 82, pp. 62-63, September 1960
243. ARCHITECTURE ON THE MOON  
Sugerman, B. F.  
*Georgia Tech Engineer*, v. 22, no. 1, pp. 14-15, 30, 39, October 1960
- A "Moon building" is described in this article. (*AI/S*, 1960, #23,171)
244. THE FEASIBILITY OF USING REMOTELY CONTROLLED VEHICLES TO DECONTAMINATE LARGE PAVED AREAS  
Schlemm, C. L., Anthony, A. E., Jr.  
October 1960  
Air Force Special Weapons Center, Kirtland AFB, N. Mex.  
AFSWC-TN-60-25, Project 7806
- Studies were performed to determine the feasibility of using a remotely controlled vehicle to sweep and remove radioactive debris from large paved areas. Test data were collected for comparison of the remote operation and manual operation of the vehicle. The test parameters included comparison of decontamination efficiency, time needed for decontamination, and sweeping patterns. A comparison of test parameters indicated that it is feasible to use a remotely controlled sweeper to decontaminate an area. Approximately the same decontamination efficiencies were obtained under remote and manual operation (approximately 99.7%). The operating time for remote decontamination was about twice that for manual. This time can be reduced as the area to be swept becomes larger and the operator becomes more proficient. These results were obtained on a small area (approximately 3000 sq ft). The time lost was mostly in turning around and reorienting the vehicle at the end of each sweeping pass on the contaminated area. (*NSA*, 1961, #2368)
245. SURFACE EXPLORATION OF THE PLANETS  
Behn, E. R.  
*ARMA Engineering*, v. 3, no. 4, pp. 16-18, November 1960

The possibility of using a gyro compass for land navigation systems on the Moon or some other solar planet is discussed. (*LP*, #82)

246. FOUR-WHEEL TRACTOR BRAKING

Ryan, K. E., Terry, C. W.  
*Agricultural Engineering*, v. 41, no. 11,  
pp. 746-747, 751, November 1960

A test was performed on an experimental four-wheel brake tractor to gather information on designing an effective four-wheel braking system. A four-wheel braking system is safer and more effective; it doubles the amount of braking force obtainable from rear wheel braking, prevents sliding and jackknifing, and prevents accidents by virtue of increased control over the vehicle. (*EI*, 1961)

247. TRACKING MECHANISMS AND COUPLINGS FOR A COMBAT SUPPORT TRAIN CONCEPT. PHASE I. CURRENT STATE-OF-THE-ART TECHNOLOGY

Jindra, F.  
November 1960  
Southwest Research Institute, San Antonio, Texas  
Final Report, R EE-384, TREC Technical Report  
60-68, DA-177-tc-631  
AD-248,445

A comprehensive survey is presented of literature pertaining to analytical and experimental evaluation of trailers and trailer components. Four-wheel steering of trailers is considered. Upon defining the functional requirements for tracking systems of a train-type vehicle, practical concepts on tracking mechanisms are proposed. Future work and development are outlined.

248. LUNAR SURFACE VEHICLE

Hofstein, L. L., Cacciola, A. W.  
American Rocket Society, Inc., New York, N.Y.  
Paper 1424-60, presented at ARS Fifteenth Annual Meeting, Washington, D. C., December 5-8, 1960

Vehicles to support lunar operations will be required at the same time as the system accomplishing the prime missions. A family of vehicles for this purpose is postulated: robot, one-man vehicle, and three-man vehicle. Conditions under which these vehicles must operate on the Moon are outlined, and functional requirements are established. The use of a capsule rather than space suit is examined, and the capsule evolved is discussed. Problem areas involved in the vehicle development are enumerated, and the resulting vehicle is described. Stowage of vehicles and techniques for landing them on the Moon are briefly reviewed. (LP, #307)

249. CERN PNEUMATIC PLATFORM

*The Engineer*, v. 210, no. 5472, p. 992,  
December 9, 1960

The development of a device which utilizes a type of air cushion principle for moving heavy equipment is discussed. The advanced model had a supporting surface of about  $3.5 \text{ m}^2$  surrounded by a rubber gasket pressed against the ground by auxiliary air pressure of  $0.65 \text{ kg/cm}^2$ . By filling the cushion with air compressed to about  $1 \text{ kg/cm}^2$  g, a load of 28 tons could be lifted. The device will be used for moving focusing lenses of synchrocyclotron, 100-ton magnets, etc. (*EI*, 1961)

250. MOBILE ARMS MOVE OUT OF THE LAB—GO UNDER THE SEA, OUT INTO SPACE

Merris, D.  
*Product Engineering*, v. 31, no. 53, pp. 15-18,  
December 26, 1960

A discussion is presented of the robot-type vehicles now in operation for doing hazardous or underwater jobs. The application of these robots for work on the lunar surface is considered.

251. SOME NOTES ON HOVERCRAFT

Crago, W. A.  
*Society of Engineers, Journal and Transactions of the*, v. 50, no. 4, pp. 141-157, October-December 1960

Principles of hovercraft are explained. Equations are presented for calculation of forces, or of power required, to obtain hovering effect at zero speed, and also for the case when power requirement for forward speed is introduced. Also discussed are hover-height relations, calculations of cushion effects and stability in sea, combined use of hovercraft and hydrofoil, influence of cushion pressure on jet effect and various jet systems, and sidewall systems and jettied sidewalls. (*EI*, 1961)

252. A LUNAR POWER PLANT

Armstrong, R. H., Carter, J. C., Hummel, H. H.,  
Janike, M. J., Marchaterre, J. F.  
*American Nuclear Society, Transactions of the*,  
v. 3, no. 2, pp. 383-384, December 1960

A concept of a nuclear powerplant to be assembled on Earth and operated on the Moon is presented. The two principal design objectives are reliability and high specific power. Wherever there is an incompatibility between these two objectives, the decision favors reliability. The design is based on the premise that the powerplant must

be designed on the basis of current technology and with a minimum of research and development. (LP, #895)

**253. A HOME AWAY FROM HOME**

Page, F.

*SC Engineer*, v. 11, no. 2, pp. 14-15, 28,  
December 1960

A theoretical design of a structure well-adapted for space use, which would be located on the Moon, is discussed. This structure would be an integrated unit containing living, working, limited food production, research, construction, and launching spaces. (AI/S, 1961, #30,278)

**254. TESTS FOR AGRICULTURAL TRACTORS**

1960

British Standard Institution, London, England  
British Standard 1744

Standard specifies performance tests for agricultural wheeled and track laying tractors with spark ignition or compression ignition engines. Power outlet tests are for main power takeoff as compulsory test; for tractors without power takeoff, engine test is required. Belt tests and subsidiary power takeoff tests are included on an optional basis. Drawbar tests deal with pneumatic tired steel wheeled or track laying tractors as field tests on various types of surface, or as tests on moving track. (EI, 1961)

**255. MOON BASE; TECHNICAL AND PSYCHOLOGICAL ASPECTS**

Helvey, T. C.

John F. Rider Publisher, Inc., New York, N.Y., 1960  
Rider Publication 266

**256. STATUS OF GEM DEVELOPMENTS**

Southcote, M. F.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 270A, presented at SAE National Meeting,  
Detroit, Mich., January 9-13, 1961  
(Abstracted in *SAE Journal*, v. 69, no. 4, pp. 35-40,  
April 1961)

A survey is made of the GEM (ground effect machine) or air-cushion vehicle relating to some concepts, accomplishments, and problems which must be solved. Lifting power requirements of annular jet concept are defined and the effects of geometry on power requirements are

given. Propulsion, stability, and control aspects are discussed. Two design studies are used in an operational analysis which compares air-cushion vehicle operating costs with those of existing transport media. (EI, 1961)

**257. MARINE AIR CUSHION VEHICLES—OPERATIONAL LIMITATIONS AND FUTURE DEVELOPMENTS**

Fielding, P. G.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 270B, presented at SAE National Meeting,  
Detroit, Mich., January 9-13, 1961  
(Abstracted in *SAE Journal*, v. 69, no. 4, pp. 35-40,  
April 1961)

Comparisons of over-water GEM with other marine vehicles are made and some of the major problem areas associated with over-water operation highlighted. A review is presented of current hardware and designs. Marine types for commercial and military operations are described and illustrated. The size and the speed range capability of each type given are indicated. (EI, 1961)

**258. GROUND-EFFECT MACHINE APPLICATIONS IN MIXED TERRAINS**

Cutler, M. M., Kossar, A. F.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 270C, presented at SAE National Meeting,  
Detroit, Mich., January 9-13, 1961  
(Abstracted in *SAE Journal*, v. 69, no. 4, pp. 35-40,  
April 1961)

The capability of machines to travel over land, water, mud, ice, snow and sand suggests applications as high-speed amphibian and off-road land vehicles. Low footprint pressure, usually 0.1 to 0.3 psi, suggests military application for mine detection. Also covered are the following: factors affecting operation; materials and hardware used; design and fabrication problems of Curtiss-Wright GEM prototype. (EI, 1961)

**259. GEM FOR AMPHIBIOUS SUPPORT**

Wosser, J. L., Van Tuyl, A. J.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 270D, presented at SAE National Meeting,  
Detroit, Mich., January 9-13, 1961  
(Abstracted in *SAE Journal*, v. 69, no. 4, pp. 35-40,  
April 1961)

A design study for Amphibious Support GEM shows how best to achieve optimum performance once military requirements for such vehicles are developed. Considerations of various alternatives and compromises that might be necessary are pointed out, and final design figures and performances and design parameters used are given. Government-sponsored research work in progress is summarized in tabular form and by task description. (*EI*, 1961)

260. TEST TRACKS FOR VEHICLE TRACTIVE ABILITY TESTING  
Bailey, D. C.  
Society of Automotive Engineers, Inc.,  
New York, N.Y.  
Paper 305A, presented at SAE National Meeting,  
Detroit, Mich., January 9-13, 1961

Background and construction details are given of tractor test tracks built by Military Engineering Experimental Establishment, Christchurch, England. Materials used, such as rubberized bitumen, grit sand, soft limestone, hard limestone, clay, and mixtures are specified. A special technique is developed for mixing rubberized bituminous clay based on theory, which is given. The method of laying is included. (*EI*, 1961)

261. MILITARY STUDIES GROUND EFFECT VEHICLE  
Anderton, D. A.  
*Aviation Week*, v. 74, pp. 71-76, January 23, 1961

262. MOONMOBILES TO INVESTIGATE LUNAR SURFACE BEFORE MAN  
GSE, v. 2, no. 6, pp. 37-38, December 1960-January 1961

The Jet Propulsion Laboratory is currently engaged in design studies of unmanned roving vehicles. This article outlines the design requirements for such vehicles. (*AI/S*, 1961, #30,064)

263. INVISCID-INCOMPRESSIBLE-FLOW THEORY OF STATIC PERIPHERAL JETS IN PROXIMITY TO GROUND  
Strand, T.  
*Journal of the Aerospace Sciences*, v. 28, no. 1, pp. 27-33, January 1961

An "exact" flow theory of peripheral jets issuing symmetrically from hovering aerial-ground vehicle is presented. Results are valid for all jet thickness/vehicle

height ratios. The limit of applicability of existing theories (very low thickness/height ratios) are defined; life augmentation and lift/power ratios are also calculated. (*EI*, 1961)

264. LUNAR SURFACE VEHICLES  
Hofstein, L. L., Cacciola, A. W.  
*Astronautics*, v. 6, no. 2, pp. 36-38, 52-54, February 1961

265. HOVERCRAFT—SOME DESIGN PROBLEMS  
Jones, R. S.  
*Aerospace Engineering*, v. 20, no. 2, pp. 16-17, 49-51, 53-57, February 1961

Design studies made to determine the influence of aerodynamic parameters are reviewed. Basic assumptions or ground rules used are stated, and power/weight and lift/drag ratios are given. Effects of jet angles and thicknesses are cited. Presented also are a design study on the family of GEM's ranging from 25 to 400 tons, and an evaluation of design cushion pressure. Dynamic stability over waves is considered as well as economic problems.

266. APPROACH TO OPERATIONAL FEATURES DESIRABLE IN MILITARILY ACCEPTABLE GEM  
Fielding, P. G.  
*Aerospace Engineering*, v. 20, no. 2, pp. 18-19, 57-60, February 1961

This approach is based on activities of BOOZ-Allen Applied Research, Inc. Types of environments to which the vehicle is subjected are natural, induced, and combat. Noise elimination, vulnerability, and maintenance aspects are discussed. Vehicle classification and desirable features are suggested. (*EI*, 1961)

267. MARKEFFEKTFARKOSTER—FRAMTIDENS LUFTKUDDEBURNNA TRANSPORTMEDEL (GROUND EFFECT MACHINES—NEW VEHICULAR CONCEPT)  
Jungstrom, O. L.  
*Vag Och Vatten Byggaren*, Stockholm, no. 1, pp. 3-8, February 1961

Various ground effect machines are described. Problems of propulsion, friction, and maneuvering are discussed as well as phenomena which arise over water. (*EI*, 1961)

268. FLYING SEDAN OF THE FUTURE

Fisher, G.

*Coronet*, v. 49, pp. 169-173, February 1961

269. MANNED LUNAR VEHICLE SYSTEM,  
VOLUME I: FEASIBILITY SURVEY, PART I  
March 7, 1961

Martin-Marietta Corp., Baltimore, Md.  
ER-11245M, Part I

A survey has been made to determine the design feasibility of an advanced manned lunar vehicle system for which two purposes are assumed: exploratory operations toward development of permanent manned space stations and manned lunar reconnaissance flights.

270. LUNAR EXPLORATION SYSTEMS;  
ABSTRACT

O'Rourke, N. W.

*Aircraft Engineering*, v. 33, p. 84, March 1961

271. SURFACE EXPLORATION OF THE MOON

Stewart, P. A. E.

*Spaceflight*, v. 3, no. 2, pp. 34-48, March 1961

A ten-year program to explore the Moon is outlined; the problems and some possible solutions are examined. A sample expedition to the Moon is analyzed. (AI/S, 1961, #30,990)

272. EFFECT OF RATIO OF JET AREA TO  
TOTAL AREA AND OF PRESSURE RATIO  
ON LIFT AUGMENTATION OF ANNULAR  
JETS IN GROUND EFFECT UNDER  
STATIC CONDITIONS

Goodson, K. W., Otis, J. H., Jr.

March 1961

National Aeronautics and Space Administration,  
Washington, D. C.

TN D-720

An investigation was undertaken in which ratio of jet area to total area ranged from 1.00 to 0.02 and pressure ratio ranged from 1.04 to 1.95; several configurations with center jets were tested through angle of attack to determine pitching moment characteristics. Data showed that annular jet vehicles are unstable at ratios of height above ground to nozzle diameter above about 0.10. Stability can be improved by the use of large center jets. (EI, 1961)

273. LUNAR COLONY

Binder, O. O.

*Space World*, v. 1, no. 7, pp. 32-35, 50, 52,  
April 1961

A lunar housing simulator being built by the Martin Company in Denver, Colorado, is described. (AI/S, 1961, #30,703)

274. EFFECTS OF GEOMETRIC VARIATIONS  
OF LIFT AUGMENTATION OF SIMPLE-  
PLENUM-CHAMBER GROUND EFFECT  
MODELS

Davenport, E. E.

April 1961

National Aeronautics and Space Administration,  
Washington, D. C.  
TN D-756

The effects of ratio of inlet area to exit area, inlet configuration, and plenum chamber depth were investigated. Increasing ratio of inlet area to exit area increased lift augmentation. The use of multiple inlets eliminated negative lift augmentation at intermediate heights. Modifications to inlet to diffuse effectively entering air improved lift augmentation at intermediate heights. (EI, 1961)

275. LUNAR PROBES AND LANDINGS, AN  
ANNOTATED BIBLIOGRAPHY

Evans, G. R., Compiler

May 1961

Lockheed Aircraft Corporation, Missiles and Space  
Div., Sunnyvale, Calif.  
SB-61-24

This research is concerned primarily with lunar probes, lunar landings, design configurations, materials applicable to spaceships, etc. Combined with a companion search, "Lunar Atmosphere and Surface Conditions," LMSD-5-10-61-2/SB-61-22, the two are submitted in support of a program for an eventual lunar landing. The period covered is generally from January 1959 to May 1961.

276. SOME EXPERIENCES WITH GROUND  
EFFECT DEVICES

Amann, C. A., Scheel, J. W.

Society of Automotive Engineers, Inc.  
New York, N.Y.

Paper 370B, presented at SAE National Summer  
Meeting, Atlantic City, N. J., June 5-9, 1961

Fundamentals of air bearing, plenum chamber, and annular jet are presented. A study was carried out at

General Motors Corp. to construct a man-carrying test vehicle. Fan design and model tests are described. Results were secured with models having 5-hp and 15-hp engines of integral propulsion system, and 15-hp fan engines of a separate propulsion system. Also considered were vehicle lift and thrust, and vehicle directional control. Over-all impressions are given. (EI, 1961)

**277. MOON STUDY CONTRACT**

*Aeroplane and Astronautics*, v. 100,  
no. 2591, p. 703, June 15, 1961

Martin Company has been awarded a NASA contract to study methods of landing men on the Moon and setting up a permanent station there. (AI/S, 1961, #40,328)

**278. HOVERING FLIGHT INVESTIGATION OF  
TWO METHODS OF CONTROLLING  
MAN-CARRYING DUCTED-FAN VEHICLE  
OF FLYING-PLATFORM TYPE**

Parlett, L. P.

June 1961

National Aeronautics and Space Administration,  
Washington, D. C.

TN D-841

The vehicle had counterrotating fans operating in a duct 20 in. long; thrust of the duct fan assembly was supplemented by four air jets, directed parallel to axis of fan rotation and spaced equally around outer circumference of duct inlet lip. Results are presented of tests performed during which men of varying previous experience served as pilots of 4-ft-D vehicle, controlling it kinesthetically or by a system of air jets actuated by an aircraft-type control stick. (EI, 1961)

**279. BENEFITS OF NEW SIDEWALL  
HOVERCRAFT**

*Engineering*, v. 192, no. 4968, p. 4, July 7, 1961

Sidewall hovercraft are particularly suitable for fairly high speeds along narrow waterways. A craft known as Hovership has been developed by William Denny & Bros., Scottish Shipbuilders, in collaboration with Hovercraft Developments, Ltd., and weighs 4½ tons; it represents the first phase of a research program to produce a passenger-carrying hoverferry.

**280. OFF-ROAD LOCOMOTION**

Ogorkiewicz, R. M.

*The Engineer*, v. 212, no. 5502, pp. 4-6,  
July 7, 1961; no. 5503, pp. 59-62, July 14, 1961;  
no. 5504, pp. 84-87, July 21, 1961

A report is given on the following papers presented at the First International Conference on Mechanics of Soil Vehicle Systems held in Turin and Saint Vincent, Italy, June 12-16, 1961: "Theoretical Analyses and Experimental Work" (July 7); "Prediction of Vehicle Performance Off Road" (July 14); and, "New Vehicles and Components"—e.g., walking machines, aircraft with pneumatic tracked landing gear, tractors with pneumatic and roller tracks, and articulated tracklayers. Also included are possible characteristics of lunar soil. (July 21). (EI, 1961)

**281. NUCLEAR POWERPLANT FOR MOON  
OUTLINED**

Kolcum, E. H.

*Space Technology*, v. 7, no. 5, pp. 50-51, 53,  
July 31, 1961

A compact 1-Mw nuclear powerplant for operation on the Moon, weighing less than 8 tons is discussed. Mercury is used as a coolant and the plant is powered by a uranium reactor theoretically able to operate for two years. A special feature is use of foldable radiators, 72 ft long, to remove condensation heat from the mercury cycle. The powerplant is conceived for fabrication and assembly on Earth, direct launch as payload of an advanced *Saturn* or *Nova* vehicle, and soft landing at a site on the Moon where meteor activity is at a minimum. (LP, #954)

**282. CONCEPTUAL NUCLEAR PROPULSION  
SYSTEM FOR GROUND EFFECT  
MACHINES**

Westmoreland, J. C., Dee, J. B., Loos, J. E.

*Aerospace Engineering*, v. 20, no. 7, pp. 16-17,  
59-64, July 1961

A vehicle of 306 tons gross weight is considered. A base pressure of 50 lb/ft<sup>2</sup> is established and maintained through means of annular jet configuration. Vehicle performance and hovering airflow requirements are considered. A proposed powerplant employs a gas-cooled reactor with closed-cycle gas turbine. A schematic is given of a reactor complex for a 75-Mw closed-cycle helium-cooled reactor system. Details of principal components and applications are presented. (EI, 1961)

**283. LUNAR EXPLORATION VEHICLES**

*Proceedings of Lunar and Planetary Exploration  
Colloquium*, v. 2, no. 3, pp. 57-72, August 15, 1961

(Published by North American Aviation, Inc.,  
Los Angeles, Calif.)

(See also *The Spectrum*, v. 1, no. 2, pp. 10-12,  
42-55, November 1961)

The capabilities of lunar exploration vehicles and the problems associated with the lunar environment were considered in a panel discussion conducted during the Lunar and Planetary Exploration Colloquium held in Downey, California in November 1960. The discussion was led by C. I. Cummings. (AI/S, 1962, #50,311)

284. PROSPECTOR STUDY PROGRAM: A FEASIBILITY STUDY AND CONCEPTUAL DESIGNS FOR OPERATIONAL UNMANNED LUNAR MISSIONS FOR 1964-1965, VOLUME I  
August 15, 1961  
Northrop Corp., Norair Div., Hawthorne, Calif.  
N-269-61-12, Vol. I

An unmanned lunar roving vehicle mission and an unmanned lunar Earth-return vehicle mission are shown to be feasible and desirable for the 1964 to 1965 time period. A combination *Saturn C-1* and *Centaur* booster vehicle is utilized for injecting the payloads into the Earth-Moon transit orbits. Conceptual designs of the spacecraft or lunar busses that deliver and soft-land the payloads on the Moon are described, as well as conceptual designs of the roving and Earth-return vehicles. Also presented for all of these vehicles are the mission and system requirements, system descriptions and system operation, design analyses, performance characteristics, and various alternate approaches and areas for future study.

285. PERFORMANCE NOMOGRAMS FOR GEM'S  
Fielding, P. G.  
*Aerospace Engineering*, v. 20, no. 8, pp. 10-11,  
67-70, August 1961

Charts presented allow the designer to estimate lift power, propulsion power, and power required to climb, stop, and turn for separate lift/propulsion ground effect machines. To achieve laminarization by proved methods, a portion of the boundary layer must be sucked from affected surface and pumped overboard. Means of obtaining power to drive suction compressor are classified and discussed qualitatively. (EI, 1961)

286. 4-WHEEL DRIVE TRACTOR FOR LARGE FARMS  
Askins, W. J.  
Society of Automotive Engineers, Inc.  
New York, N.Y.  
Paper 391B, presented at SAE National Meeting,  
Detroit, Mich., September 11-14, 1961

A rubber-tired tractor has been designed and developed by Frank G. Hough Co. The tractor can be roadeed easily at speeds up to 25 mph, while the top speed of a crawler tractor is around 8 mph. A 375-hp turbocharged diesel engine, derated to 300 hp by limiting fuel to injectors, is used. Details of transmission, steering, brakes, clutch, and controls are given as well as of field tests. (EI, 1961)

287. HOW TO DRIVE IT. HOW TO STEER IT. SELF-PROPELLED CONUNDRUM  
Borland, J., Heitshu, D. C.  
Society of Automotive Engineers, Inc.,  
New York, N.Y.  
Paper 393B, presented at SAE National Meeting,  
Detroit, Mich., September 11-14, 1961

An analysis of self-propelled chassis with respect to possible configurations of drive and steer is divided into conventional differential drive with mechanical steer and eight different combinations thereof, and independent wheel drive with full control and four possible designs. Advantages and disadvantages of each combination are given. Applications are suggested for combines on farm, lift trucks, small loaders, scrapers, and wagons. (EI, 1961)

288. MOON ROOM; PLASTICS-LINED BALLOON, ASTRONAUTS' HOME IN MOON COLONY  
*Plastics World*, v. 19, p. 18, September 1961

289. IMPLEMENT REQUIREMENTS IN RELATION TO TRACTOR DESIGN  
Davis, W. M.  
*Agricultural Engineering*, v. 42, no. 9, pp. 478-483,  
September 1961

Design requirements of towed, hitch mounted, integrally mounted and power-takeoff driven implements to assure compatibility with tractor are discussed. (EI, 1961)

290. ARCTIC SCOOTER TO WADE RIVERS  
*Oil and Gas Journal*, v. 59, p. 108, October 2, 1961

291. ROVING LUNAR VEHICLES—PART I: ROVING LUNAR SURFACE VEHICLES STUDIED  
Miller, B.  
*Aviation Week & Space Technology*, v. 75, no. 14,  
pp. 52-69, October 2, 1961

This article discusses in detail the structural design, vehicle locomotion, and operational limitations of roving vehicles, and gives a description of the leg motion for the *Prospector*. (AI/S, 1961, #41,110)

**292. LUNAR ENVIRONMENT FOR ROVING VEHICLES**

*Aviation Week & Space Technology*, v. 75, no. 14, p. 61, October 2, 1961

The principal characteristics of the lunar surface, as determined from available data gathered by the Jet Propulsion Laboratory, are outlined. These are the conditions to be assumed for engineering design studies of roving lunar surface craft. (AI/S, 1961, #41,141)

**293. MORE NEWS OF VICKERS' HOVERCRAFT**  
*Engineering*, v. 192, p. 433, October 6, 1961

**294. ROVING LUNAR VEHICLES—PART II: ROVING VEHICLE CONTROL POSES PROBLEMS**

Miller, B.  
*Aviation Week & Space Technology*, v. 75, no. 15, pp. 71-79, October 9, 1961

Some of the difficulties and factors which complicate the control of the craft, such as transmission delay, human operation, lunar surface communication, and surface navigation, are reviewed. (AI/S, 1961, #41,111)

**295. AIR-CUSHION CRAFT DEVELOPMENTS**  
*Shipbuilding and Shipping Record*, v. 98, no. 15, pp. 474-475, October 12, 1961

Information is given on S.R.N. 2 of Westland Aircraft Co. and V.A. 1 (also V.A. 2, 3, 4) of Vickers-Armstrongs (South Marston), Ltd., which were developed in conjunction with Hovercraft Developments, Ltd., and on Cushioncraft Type C.C. 2 developed as private venture by Britten-Norman, Ltd. (EI, 1961)

**296. THREE MEN ON THE MOON**  
*Machine Design*, v. 33, pp. 24-26, October 12, 1961

**297. STEREO COLOR TV SYSTEM MAY GUIDE MOON ROBOT**  
*Electronics*, v. 34, pp. 30-32, October 13, 1961

**298. SINGLE-ENGINED, FOUR-WHEEL-DRIVE ARTICULATED VEHICLE**  
*The Engineer*, v. 212, no. 5517, p. 653, October 20, 1961

A dumper in which one engine drives all four wheels through only two universal joints has been evolved by Thwaites Engineering Co., England. Mechanical simplicity is attained by steering the vehicle, not by swiveling individual wheels, but by articulating the chassis about a pivot at the midpoint of the wheelbase. A new dumper, designed for 2-ton payload, is powered by an air-cooled twin cylinder Petter PH2 diesel engine giving 16.4 hp at 2000 rpm. (EI, 1961)

**299. DESIGNERS SIFT MOON-MOBILITY METHODS**

*Machine Design*, v. 33, no. 22, p. 32, October 26, 1961

**300. NAVY TESTS 100-KNOT AIRSHIPS; GROUND EFFECT MACHINES (GEM)**

Douglas, D. W., Jr.  
*Steel*, v. 149, p. 76, October 30, 1961

**301. DESIGNED FOR TRACTION**

*Product Engineering*, v. 32, no. 40, p. 76, October 30, 1961

The types of mobility systems for Moon surface vehicles which are being considered by several research laboratories are described. Rolling and walking vehicles are included.

**302. THE LUNAR PROBLEM, VOLUME I; BIBLIOGRAPHY, VOLUME II; INDEX**

Magnolia, L. R., Trew, J. R.

October 1961

Space Technology Laboratories, Inc., Technical Information Center, Los Angeles, Calif.

Literature Research Group, Bibliography 40,

STL/AB 61-5110-40

This bibliography is issued in two volumes. Volume I is composed of annotated and abstracted references. Volume II, the index, provides coverage by author, source, and fields of interest.

**303. SPACE CARTOONIST**

Rublowsky, J.

*Space World*, v. 1, no. 11, pp. 23-25, 60-61, October 1961

Four lunar roving vehicle models are briefly described and their feasibility discussed. The engineer responsible for the design of these vehicles has also presented some "tongue-in-cheek" drawings of space vehicles. (AI/S, 1962, #50,087)

**304. LOCATION OF LUNAR BASE**

Salisbury, J. W., Campen, C. F.

October 1961

Air Force Cambridge Research Laboratories,  
Bedford, Mass.

AFCRL 870, GRD Research Note 70

The location of a lunar base is considered in relation to geology, function, and design. Geological considerations suggest that a base be located near a rille in the lunar highlands. Astronomical considerations suggest that two lunar bases be established 180 deg apart on the lunar equator, preferably on high ground to provide for maximum range of transmission for surface communications. After detailed consideration of subsurface structures, surface characteristics and natural resources, a site south of the Hyginus Rille, near the crater Agrippa, is suggested for an underground lunar base. (AI/A, 1962, #5666)

**305. VERSATILE SUSPENSION DEVISED FOR  
MILITARY CRAWLER TRACTOR**

Reynolds, R. K., Mayer, E.

SAE Journal, v. 69, no. 10, pp. 48-54, October 1961

The suspension system of the Universal Engineer Crawler Tractor, built by International Harvester Co., allows the operator to control vehicle height and tilt with suspension in unsprung or rigid condition, and provides usual springing, damping, and automatic leveling. Details of suspension analysis are given. Component design and testing are examined, and test results of the first prototype are stated. Second-generation machine and adoption of new leveling valve arrangements are discussed. A diagram of hydropneumatic suspension is also presented. (EI, 1961)

**306. CANADIAN CONTRIBUTION TO GROUND  
CUSHION STORY**

Frost, J. C. M.

Canadian Aeronautical Journal, v. 7, no. 8,  
pp. 286-302, October 1961

A review is given of various concepts and activities. Early tests on the annular jet carried out by Avro Aircraft, Ltd., are discussed, and the equipment used is described. Wind-tunnel tests on a circular planform are

examined. Also considered are the development of an Avrocar, which is 18 ft in diameter, having a circular wing with a 20% elliptical section and a 2% camber. Its gross weight with 2000 lb of useful load is estimated at 5650 lb. Power is supplied by three J69-T-9 turbojet engines. Ground cushion problems encountered are discussed. An Avrocar stabilizer, a control system, hovering, and wind tunnel testing are described. (EI, 1961)

**307. SNOW TRACTOR INSURES SNOW PATROL**

*The Electrical World*, v. 156, p. 65,

November 13, 1961

**308. BUILDERS BLAST OUT UNDERGROUND  
FORTRESS**

*Engineering News-Record*, v. 167, pp. 38-40+,  
November 16, 1961

**309. DEVELOPMENTS IN TRACTOR DESIGN**

*The Engineer*, v. 212, p. 882, November 24, 1961

**310. ARTICULATED TRACKED VEHICLES**

Ogorkiewicz, R. M.

*The Engineer*, v. 212, no. 5522, pp. 849-854,  
November 24, 1961

The history of tracked vehicles from 1897 is reviewed. Interest revived in the 1940's, and types of vehicles built in the United States and Canada are described. These include various types for military, industrial, and polar expedition purposes on differing terrains.

**311. ADVANTAGES OVER HYDROFOILS  
CLAIMED FOR NEW CRAFT:  
SKYDROFOIL**

*Engineering*, v. 192, p. 668, November 24, 1961

**312. AERODYNAMIC DRAG OF GROUND  
EFFECT MACHINES**

Ando, S., Miyashita, J.

*Aerospace Engineering*, v. 20, no. 11, pp. 24-25,  
79, 81, November 1961

The concept of rotation loss is discussed with reference to trailing vortex induced by flow ejected from GEM or ram wing. The authors designate reduction of parasite drag "interference thrust" and propose that, because of its large amount, it must be taken into account on estimating GEM performance. Investigation of the interference

thrust mechanism may be useful to improve GEM performance or to find superior types of GEM. (*EI*, 1961)

**313. GEARLESS TRACTOR**

*Mechanical Engineering*, v. 83, pp. 80-81,  
November 1961

**314. AIR FILTER SYSTEM FOR FALLOUT SHELTERS**

*Air Conditioning, Heating, and Ventilating*,  
v. 58, p. 111, November 1961

**315. DYNAMICS OF TRACKLAYERS**

Little, L. F.  
*Automobile Engineer*, v. 51, no. 11, pp. 427-429,  
November 1961

Efforts made in the testing and classification of soils are reported, and soil properties are evaluated in terms of vehicle mobility. A report is given of the development of track-link incorporation of strain gage weighing elements which, when assembled into the track chain and connected by a roving cable to a dynamic strain recorder, enable a continuous record of the load throughout ground contact to be obtained. Dynamic forces are analyzed and practical applications are given. (*EI*, 1961)

**316. TWIN DISC POWER SHIFT TRANSMISSION**

Snay, J. B.  
*SAE Journal*, v. 69, no. 11, pp. 68-74,  
November 1961

A transmission built by Twin Disc Clutch Co. for heavy-duty vehicles, such as farm tractors, off-highway trucks, and earth-moving equipment, uses the best features of the hydraulic torque converter and multirange direct geared transmission. The converter, gearbox, and transfer case are described. Details of construction and design are given with schematics. (*EI*, 1961)

**317. CURTAIN JET**

Ehrich, F. F.  
*Journal of the Aerospace Sciences*, v. 28, no. 11,  
pp. 855-860, 871, November 1961

The curtain jet, a two-dimensional fluid wall used to contain support pressure on the underside of ground effect machines, is examined. The jet variations studied are the bifurcated jet, in which a portion of the flow

streams into the support pressure region, and the deflected jet, in which none of the flow penetrates into the support pressure region. The Kirchoff-Helmholtz free streamline analysis is applied, and the results are presented for effect of nozzle inclination, geometry on flow requirements, and support pressure differential at varying altitudes. (*EI*, 1961)

**318. USAF PLANS LUNAR SHELTER DESIGN STUDY**

Stone, I.  
*Aviation Week & Space Technology*, v. 75, no. 26,  
pp. 18-19, December 25, 1961

The design concepts and requirements for a prefabricated, erectable lunar shelter are discussed. (*AI/S*, 1962, #50,088)

**319. LUNAR EXPLORATION VEHICLES AND EQUIPMENT**

Froehlich, J., Hazard, A. B.  
American Astronautical Society, Inc.,  
New York, N.Y.  
Preprint 1, presented at the AAS Lunar Flight  
Symposium, Denver, Colo., December 29, 1961

The design objectives and underlying assumptions for a functional manned moonmobile are discussed. Possible means of locomotion, such as walkers, hoppers, hover rockets, ballistic rocket flight, wheels, and tracks, are reviewed and their respective advantages and disadvantages assayed. Probable types of prime movers, and equipment requirements for life support, spacesuits, manipulators, communications, and surface navigation are discussed. Finally, with the preceding discussion as background, several likely moonmobile configurations are described.

**320. LUNAR BASING**

DeNike, J.  
American Astronautical Society, Inc.,  
New York, N.Y.  
Preprint 12, presented at the AAS Lunar Flight  
Symposium, Denver, Colo., December 29, 1961

Factors to be considered in planning permanent, manned bases on the Moon are discussed. Particular emphasis is placed on shelter design and construction. Problems posed by lunar mission manning requirements and lunar environment are evaluated and answers proposed on the basis of four years of study by Martin Marietta engineers. Advantages and disadvantages of three basic

types of shelter systems—above-ground, covered, and tunneled—are outlined. The conclusion is that, although additional information about the lunar environment still is needed, scientists have enough data to begin the research and development phase of a permanent Moon base.

321. ANNOTATED BIBLIOGRAPHY OF LUNAR PROPERTIES, GEOLOGY, VEHICLES, AND BASES, PART II: VEHICLES, TRAJECTORIES, AND LANDINGS  
Beltran, A. A., Goldmann, J. B., Graziano, E. E.,  
Compilers  
December 1961  
Lockheed Aircraft Corp., Missiles and Space Co.,  
Sunnyvale, Calif.  
SB-61-67, Part II

Part II of this three-part lunar bibliography is concerned with manned and unmanned lunar probes, their purpose, trajectories, instrumentation, ground support, and landing site selection. Manned vehicle equipment, communications, number of crew, crew requirements, and landings are also covered, as are manned and unmanned space stations.

Part I dealt with the physical properties, geology, volcanism, selenomorphology, mineralogy and maps of the Moon. (For Part III, see Entry #339.) (AI/A, 1962, #5307)

322. HOVERCRAFT DEVELOPMENTS:  
EDITORIAL  
*Aircraft Engineering*, v. 33, p. 343, December 1961

323. HOVERCRAFT DEVELOPMENTS  
*Mechanical Engineering*, v. 83, p. 92,  
December 1961

324. WHICH TRUCK, GAS OR ELECTRIC?  
Berkwitt, G. J.  
*Mill and Factory*, v. 69, pp. 69-72, December 1961

325. CONTROL OF GROUND EFFECT MACHINES  
Lieberman, D. A., Fielding, P. G., Neff, W. J.  
*Aerospace Engineering*, v. 20, no. 12, pp. 28-29, 50,  
December 1961

The inherent stability of the GEM and the related question of its control are clearly connected to mechanics of air cushion. This paper describes GEM as a physical process and develops generalized equations of motion.

From these equations conclusions are drawn regarding control effects and comparisons made with the experimental results. (EI, 1961)

326. CRAWLERS NEEDN'T HIBERNATE: CHECK-OUT YOUR WINTER MAINTENANCE SCHEDULE

Keith, L. R.  
*Safety Maintenance and Production*, v. 122,  
pp. 59-61, December 1961

327. FORD SEES LEVICAR CHALLENGE TO AIRCRAFT [ABSTRACT]

Kucher, A. A.  
*Machine Design*, v. 33, p. 8, December 21, 1961  
(See also *Automotive Industries*, v. 126, p. 27,  
January 1, 1962)

328. SUR LE CALCUL AERODYNAMIQUE DES VEHICULES BASÉS SUR L'EFFET DU SOL  
(AERODYNAMIC CALCULATION OF GROUND EFFECT VEHICLES)

Patraulea, N. N., Andrei, St., Rado, G.  
*Revue de Mecanique Appliquée*, v. 6, no. 1,  
pp. 91-104, 1961

The relationship between nondimensional hovering parameters, geometry, and energy is established for annular and circular jets. The coefficient of inherent stability is determined. A study of variation of parameters leads to methods for improvements of operating characteristics. (EI, 1961)

329. HOVERBUS TRIES ITS ENGINES

*Machine Design*, v. 34, p. 6, January 4, 1962

330. WEIGHT UPS TRACTION OF AIRCRAFT TRACTOR

*Product Engineering*, v. 33, p. 75, January 8, 1962

331. GROUND EFFECT MACHINES

*The Engineer*, v. 213, pp. 76-77, January 12, 1962

332. GEOLOGY OF THE LUNAR BASE

Green, J.  
American Astronautical Society, Inc.,  
New York, N.Y.  
Paper 62-21, presented at the AAS Eighth Annual National Meeting, Washington, D.C.,  
January 16-18, 1962

From a consideration of tidal and gravity effects operative (or once operative) on the Moon, a greater sensitivity to volcanism might be expected than on the Earth. Details of lunar surface features support the hypothesis of volcanic origin. Base site selection may therefore have to compromise the requirements of many scientific and engineering disciplines. Early base operations will probably be controlled by trajectory considerations and terrain and mineralization features of the base site. For this reason a nonpolar caldera-type crater will probably be superior to an impact crater on a basaltic flood plain. In later base operations more independence may permit base location in a polar area, where continuous sunlight is available for ecological and power requirements. The polar base site should be adjacent to eternally shadowed zones where mineralization may be present.

At least seven technologies which involve the geoscientist may be required to maintain the lunar base: (1) tunneling and base construction, (2) extraction of gases from rock froths, (3) extraction of water from volcanics, (4) the processing of sulfur, (5) mineral dressing using existing raw materials, (6) the metallurgy of basalt, and (7) the selective volatilization of rocks using plasma techniques. The significance of the topographic low in lunar craters is discussed from the standpoint of localizing mineralization, including water. (AI/A, 1962, #5297)

333. PROTOTYPES AIRBORNE  
*The Engineer*, v. 213, p. 122, January 19, 1962

334. VEHICLE FOR SLAVE ROBOT  
Goertz, R. C., Lindberg, J. F.  
January 30, 1962  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 3,018,980 (assigned to U.S. Atomic Energy Commission, Rockville, Md.)

A reeling device is designed for an electrical cable supplying power to the slave side of a remote-control manipulator mounted on a movable vehicle. As the vehicle carries the slave side about in a closed room, the device reels the cable in and out to maintain a variable length of the cable between the vehicle and a cable inlet in the wall of the room. The device also handles a fixed length of cable between the slave side and the vehicle, in spite of angular movement of the slave side with respect to the vehicle. (NSA, 1962, #4269)

335. HOW TO APPLY TRACTOR POWER EFFECTIVELY  
*Coal Age*, v. 67, pp. 140-142, January 1962

336. NUCLEAR AUXILIARY POWER UNIT FOR LUNAR EXPLORATION  
Streb, A. J., Wilson, R. J., Bustard, T. S.  
*IRE Transactions on Nuclear Science*, v. NS-9,  
pp. 85-90, January 1962

A radioisotope-fueled thermoelectric generator is considered to be an ideal electric power supply for the initial unmanned lunar exploratory vehicles. (AI/S, 1962, #51,122)

337. HOME IS ANYWHERE FOR GETOL AIRPLANE  
DiBartola, P. E., Bulinski, R. J.  
*SAE Journal*, v. 70, pp. 76-78, January 1962

338. TWO-SPEED BATTERY VEHICLE: WORKMASTER  
*The Engineer*, v. 213, p. 281, February 9, 1962

339. ANNOTATED BIBLIOGRAPHY OF LUNAR PROPERTIES, GEOLOGY, VEHICLES, AND BASES, PART III: LUNAR AND ARCTIC EXPLORATION AND HABITATION  
Beltran, A. A., Goldmann, J. B., Graziano, E. E., Compilers  
February 1962  
Lockheed Aircraft Corp., Missiles and Space Co., Sunnyvale, Calif.  
SB-61-67, Part III

Part III, the final part of the lunar bibliography, is concerned with fixed and mobile lunar bases, construction problems, lunar surface vehicles, methods and feasibility of human habitation, establishment of lunar colonies, and ground support equipment. Arctic and antarctic exploration, embracing base construction, surface vehicles, clothing and equipment, and environmental effects on man, is included because of its applicability to lunar bases and exploration.

Part I dealt with known and conjectured properties of the Moon and Part II (see Entry #321) with vehicles, trajectories, and landings. An index to Parts I, II, and III is included. (AI/A, 1962, #5443)

340. SOME HISTORICAL NOTES ON DESIGN OF THE EARLIEST MOON VEHICLE  
*Rubber World*, v. 145, no. 5, p. 88, February 1962

This is a fantasy article written in the past tense describing the design of a two-wheeled lunar vehicle reported

to have been the first roving instrumentation package sent to the Moon. (AI/S, 1962, #50,518)

341. FOR RESEARCH AND DEVELOPMENT THERE IS NOTHING LIKE A GROUND-EFFECT MACHINE

*The Compressed Air Magazine*, v. 67, pp. 18-20, February 1962

342. PLOW THAT RIDES ON AIR; AEROPLOW Hall, C. C.

*The Compressed Air Magazine*, v. 67, p. 21, February 1962

343. GEM—GROUND-EFFECT MACHINES

*Mechanical Engineering*, v. 84, p. 54, February 1962

344. SPACE SUIT—MOONMOBILE CONCEPT PROPOSED FOR LUNAR TRAVELS Hazard, A. B.

*SAE Journal*, v. 70, p. 74, February 1962

345. TRUCK-TRACTORS NEED HOW MUCH HORSEPOWER? [ABSTRACT]

Saal, C. C., Petring, F. W.  
*SAE Journal*, v. 70, p. 79, February 1962

346. COMMERCIAL VEHICLE EXHIBITION [ILLUSTRATIONS WITH TEXT]

*The Engineer*, v. 213, p. 464, March 9, 1962

347. MOON VEHICLES

*Space World*, v. 2, no. 4, pp. 30-31, March 1962

Models of lunar vehicles that will facilitate travel over the lunar terrain are reported pictorially. (AI/S, 1962, #51,351)

348. A HOME ON THE MOON

*Industrial and Engineering Chemistry*, v. 54, pp. 12, 14, March 1962

349. AIR-CUSHIONED TRUCK WITH WHEELS

*Engineering*, v. 193, p. 514, April 20, 1962

350. OUR NEXT GOAL: MAN ON THE MOON Mandel, P.

*Life*, v. 52, no. 17, pp. 62-85, April 27, 1962

Many facets of lunar exploration are considered. The problems involved in placing men on the Moon and providing them with the necessities for survival in a hostile environment are discussed. A pictorial description of a lunar roving vehicle is presented. (AI/S, 1962, #51,274)

351. SUBSONIC VTOL AND GETOL IN PERSPECTIVE

Stepniewski, W. Z.

*Aerospace Engineering*, v. 21, pp. 10-26, April 1962

352. 150-KNOT GEM CRUISE

Strand, T.

*Aerospace Engineering*, v. 21, pp. 38-44, April 1962

353. NEW VEHICLE DESIGNS AT LEIPZIG FAIR Scott, D.

*Automotive Industries*, v. 126, pp. 44-45, May 1, 1962

354. NEW POWER FOR JEEP

*Machine Design*, v. 34, p. 32, May 10, 1962

355. FULL-SIZE TRACKED HOVERCRAFT GOES ON THE DRAWING BOARDS

*Machine Design*, v. 34, p. 6, May 10, 1962

356. NUCLEAR POWER FOR THE POLAR REGIONS

Dufek, G. J.

*National Geographic*, v. 121, no. 5, pp. 712-730, May 1962

Camp Century, one of the world's most extraordinary military installations, lies 150 mi from the western edge of the 1½-mi-thick icecap that blankets virtually all Greenland. The under-ice community, heated and lighted by a nuclear powerplant, contains 21 tunnels, including a main street 1,100 ft long. Cutaway prints and photographs show details of the facility.

357. MILITARY USE OF GROUND-EFFECT VEHICLES

Coulthard, W. H.

*Royal Aeronautical Society, Journal of the*, v. 66, pp. 293-301; discussion, pp. 301-304, May 1962

358. SLIP-FORM WALLS PRODUCE A TRIMLY HANDSOME SKI HOUSE, SHERBURNE CENTER, VT.

*Architectural Record*, v. 131, pp. 169-170, May 1962

359. BENDIX CONTINUES OWN LUNAR ROVER STUDY

Miller, B.

*Aviation Week & Space Technology*, v. 76, no. 23, pp. 54-57, June 4, 1962

Several concepts of both manned and unmanned roving vehicles which are being investigated by Bendix Corporation's Systems Division are described. (AI/A, 1962, #60,136)

360. TWIN SCREWS DRIVE FLOATING AUTO: AMPHICAR

*Machine Design*, v. 34, p. 26, June 7, 1962

361. AIR-CUSHIONED TRANSPORTS

*Chemical and Engineering News*, v. 40, p. 146, June 18, 1962

362. THE ONE-WAY MANNED SPACE MISSION

Cord, J. M., Seale, L. M.

Institute of the Aerospace Sciences, Inc., New York, N.Y.

Paper 62-131, presented at IAS National Summer Meeting, Los Angeles, Calif., June 19-22, 1962

The United States is committed to the *Apollo* lunar program which will soft land three men on the surface of the Moon and return them to the Earth sometime in the 1970 time period. The timetable of this mission is based on the availability of the booster required to launch the Earth escape payload on a lunar trajectory. It has been suggested that the Russians are planning to send a man to the Moon without provisions to return him to Earth. This is the concept of the One-Way Manned Space Mission. The concept can be applied to the Moon, to Mars or Venus, to other planets, and eventually out of the solar system. It is possible to keep the lunar explorer alive and doing valuable scientific work indefinitely. It is possible to eventually provide a means of returning the man to Earth at a later date. During his stay on the Moon, the lunar explorer or "One-Way Space Man" would be supplied with food, water, oxygen, medical supplies, etc. This would be accomplished by a logistics system consisting of unmanned cargo vehicles boosted from the Earth and retro-landed on the lunar surface. (AI/A, 1962, #61,073)

363. A METHODOLOGY FOR THE PRELIMINARY COMPARISON OF LUNAR LANDING VEHICLE CONFIGURATIONS

Ostrofsky, B.

Institute of the Aerospace Sciences, Inc., New York, N.Y.

Paper 62-97, presented at the IAS National Summer Meeting, Los Angeles, Calif., June 19-22, 1962

A method is described for selecting configurations of the lunar landing vehicle to be further investigated in preliminary design. The method uses a stochastic analysis of a network of operational states which are related by a probability statement for each required mission objective. In this way models are defined for relating all alternative combinations of the landing vehicle, the roving vehicle, and the return vehicle. A hierarchy of hardware combinations is established by attempting to normalize the resulting probability statements for specific combinations of hardware within a given payload weight class. The major advantages of this method are that (1) less desirable hardware combinations for a given payload weight class are eliminated, (2) the analyst must examine each configuration and then may trade off various aspects of the operations in terms of probability of success, and (3) reliability or other similar data are not required, but having this information, either partially or completely, more detailed results are obtained for any given objective. (AI/A, 1962, #61,075)

364. RUBBER-TIRED END-LOADERS REPLACE CRAWLER UNITS IN EAGLE-PICHER'S ILLINOIS-WISCONSIN MINES

Haffner, R. L.

*Mining Engineering*, v. 14, pp. 51-54, June 1962

365. LUNAR CONSTRUCTIONS

DiLeonardo, G.

*ARS Journal*, v. 32, no. 6, pp. 973-975, June 1962

Two approaches to the problems of lunar construction which would minimize manual efforts and utilize material of lunar origin are discussed. Methods of producing cavities for subsurface bases and utilizing lunar dust for construction of surface structures are given. (AI/A, 1962, #60,426)

366. JIGER: ANOTHER OF THE GO-ANYWHERE BUGGIES

*Mechanical Engineering*, v. 84, p. 70, June 1962

367. TWO NEW GEMS: FORD AND MARTIN  
*Mechanical Engineering*, v. 84, pp. 66-67, June 1962

368. CRUISE PERFORMANCE OF CHANNEL-FLOW GROUND-EFFECT MACHINES  
Strand, T., Royce, W. W., Fujita, T.  
*Journal of the Aerospace Sciences*, v. 29,  
pp. 702-711, 718, June 1962

369. A LUNAR SURFACE MODEL FOR  
ENGINEERING PURPOSES  
Head, V. P.  
American Rocket Society, Inc., New York, N.Y.  
Paper 2475-62, presented at ARS Lunar Missions  
Meeting, Cleveland, Ohio, July 17-19, 1962

Sub-resolution surface geometry and soil strength of the lunar maria are deduced using evidence from several disciplines. Contiguous and overlapping craterlets in sintered granular rock of strength proportional to depth are predicted for the least formidable areas, and demonstrated by table-top models of the lunar surface and by statistical and thermo-mechanical studies. Scale factors required for dynamic model testing of a lunar surface mechanism at Earth gravity are derived and tabulated, with consideration for the interaction between model mechanism and environmental model terrain. Vigorous pursuit of engineering interpretations of thermal, photometric, radar-echo, and radar-penetration evidence is shown to be well worthwhile, and close-up visual obser-

vation and soil penetration experiments are urged, as vital precursors to the manned lunar mission.

370. "GREENCHEESE" VEHICLES PROPOSED  
AS MOON SAMPLERS  
LaFond, C. D.  
*Missiles and Rockets*, v. 11, no. 4, pp. 22-26,  
July 23, 1962

Design considerations and flight sequence are discussed for a small spherical vehicle capable of obtaining lunar samples and returning to Earth. The complete package, weighing about 175 lb with a 44-in. D, will be landed by a parent vehicle which will eject it onto the lunar surface. The parent vehicle will relay to the sampler commands from the Earth control station through initiation of the return phase. (AI/A, 1962, #60,428)

371. ORDNANCE WHEELED VEHICLE DEVELOPMENTS, TODAY AND TOMORROW  
Bischoff, T. J.  
*SAE Journal*, v. 70, pp. 52-55, July 1962

372. THE POLAR LUNAR BASE  
Green, J., Finn, J. C., Jr., Brown, O. D. R.  
*Astronautics*, v. 7, no. 7, pp. 20-24, July 1962

Certain biological and geological advantages of a polar lunar base are deduced from information now available. (AI/A, 1962, #61,074)

## SOIL—PROPERTIES, SAMPLING, TESTING, AND ANALYSIS

### 373. METHODS OF ROUTINE SOIL EXAMINATION USED AT THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE

Hardy, F., Rodrigues, G.

In "Proceedings of the 1st Commonwealth Conference on Tropical and Sub-Tropical Soils, 1948," pp. 220-225

Commonwealth Bureau of Soil Science, Harpenden, England, 1949

(Obtainable as Technical Communication 46, Commonwealth Bureau of Soil Science, Harpenden, England)

Methods are described for taking and preparing soil profile samples for laboratory analyses and for determining texture, pH,  $\text{CaCO}_3$ , Comber value, organic-matter content, total-N content, C/N ratio, electric conductivity, available  $\text{P}_2\text{O}_5$ , and available or exchangeable  $\text{K}_2\text{O}$ . Arbitrary schemes are set up to rate the soils on each of the factors determined and to give numerical limits to each rating.

### 374. DETERMINATION OF TOTAL NITROGEN IN SMALL SOIL SAMPLES

Arinushkina, E. V., Boltenco, T. P.

*Vestnik Moskovskogo Universiteta*, v. 5, no. 3, *Seriya Fiziko-Matematecheskikh i Estestvennykh Nauk*, no. 2, pp. 117-124, 1950

A description is given of a semimicro Kjeldahl apparatus for determination of total N in soil samples of the size 0.3-1.0 g.

### 375. PRINCIPLES AND METHODS OF THE COLORIMETRIC DETERMINATION OF MINERAL NITROGEN COMPOUNDS IN SOILS

Szelenyi, F.

*Agrokémia*, v. 2, pp. 174-207, 1950

A relatively quick method for the determination of inorganic N compounds in soils, suitable for routine work, was developed. For soil sampling on the spot, special devices were designed. The method to be followed whether soils are tested on the spot or in the laboratory is described in detail.

### 376. THE RAPID COLORIMETRIC DETERMINATION OF ORGANIC CARBON IN SOILS

Zaffanella, M. J. R., Sabella, L. J.

*Ciencia e Investigacion*, Buenos Aires, v. 7,

pp. 419-423, 1951

One-gram soil samples are treated. The reliability of the method is within 0.02 g carbon per 100 g soil in 95% of the samples.

### 377. PROCEEDINGS OF THE FIFTH CANADIAN SOIL MECHANICS CONFERENCE,

JANUARY 10-11, 1952

May 1952

National Research Council of Canada, Associate Committee on Soil and Snow Mechanisms, Ottawa Technical Memorandum 23

AD-7241

Among the papers presented at this symposium were: "Deep Sounding Methods for Evaluating the Bearing Capacity of Foundations on Soil"; "The Swedish Steel Foil Sampler"; "Soil Temperatures and Frost Penetration"; "Resistivity Methods of Soil Exploration"; "The Neutron Moisture Meter". (ASTIA)

### 378. SOIL SAMPLING EQUIPMENT FOR RADIOLOGICALLY CONTAMINATED AREAS

Stine, W. V., Adler, S.

September 15, 1952

Signal Corps Engineering Laboratories, Evans

Signal Lab., Belmar, N. J.

Technical Memorandum M-1463

AD-3332

Sampling of surface soils was achieved by remote control with a vehicle which was equipped with ten covered-scoop containers and operated by radio control and TV guidance. The vehicle returned with ten samples to an outside designated area where the samples were removed and analyzed for radiological contamination. Each sample comprised 3 to 5 in.<sup>3</sup> of earth. The scoop containers can be removed from the vehicle and placed in a Pb-lined container from behind a concrete shield. Deep-soil sampling equipment was mounted on a similar radio-controlled vehicle, consisting of a coring tube which

is driven into the earth to a depth of about 4 ft. When the vehicle returns to the operations site, the samples are removed from the slotted tube at eight different depths, placed in Pb-lined containers, and transported to a laboratory for analysis; all operations are performed behind a concrete wall. An aerial scoop was devised as an alternate to secure samples not normally accessible when the weasel vehicles are unable to ascend the steep banks at the lip of the crater. The aerial scoop is a self-closing container which is lowered from a helicopter into the crater. The soil sample is returned to the operating site, dropped, and placed in a Pb-lined container for future analysis. Equipment was also devised for removing contaminated samples from the vehicles to the laboratory and for handling the samples in the laboratory. (ASTIA)

379. THE COLORIMETRIC DETERMINATION OF HUMUS IN SOIL

Westerhoff, H.

*Zeitschrift für Pflanzenernährung, Düngung und Bodenkunde*, v. 56, pp. 49-53, 1952

380. INVESTIGATION OF FURTHER USEFULNESS OF THE MARK II SOIL TRUSS

Harroun, D. T.

May 1953

Pennsylvania University, School of Civil Engineering, Philadelphia

Final Report, NOy-73519  
AD-78,702

The soil truss is essentially a frame of metal bars through which a central vertical load is applied, through a preselected angle, to a soil shearing foot, producing a vertical normal force and a horizontal shearing force. The practicability was studied of replacing standard laboratory tests with measured-in-place soil truss methods. Soil truss test results correlate with those of the laboratory shear test for dry sand regardless of the relative speed of operation. The angle of friction measurements correlate for any soil regardless of relative speed of operation. The value of cohesion is a function of the rate of applied load. Soil truss results and standard laboratory quick or unconsolidated direct shear tests correlate when both are run at 0.05 in./min. However, this speed is too slow for practical truss measuring. Cohesion values from the normal operation of the soil truss at  $\frac{1}{2}$  in./sec or 30 in./min correlate with those from standard laboratory constant strain direct shear tests loaded at 0.05 in./min according to a ratio of about 0.30. (ASTIA)

381. PLASTIC SOIL MECHANICS THEORIES

Pinney, E.

July 1953

California, University of, Berkeley

Technical Report 2, Nonr-22204

AD-17,491

Several different plastic soil mechanics theories are developed. The general question of testing these theories is discussed and specialized to the ordinary triaxial type of testing situation. An extension is made of the theory developed in connection with the triaxial type of testing situation to include the perfect plasticity case. An example is given in which the theory is applied to one case of a soil sample measurement made with a Hveem stabilometer. (ASTIA)

382. STUDY AND DEVELOPMENT OF METHODS FOR DETERMINING IN-PLACE DENSITY OF SOILS

Griffin, D. F.

September 23, 1953

University of Southern California, Engineering Center, Los Angeles

Final Report 19-14, NOy-73233

AD-79,282

Methods for measuring the *in situ* density of cohesionless soils were investigated by using Ottawa 20-30 sand (American Society for Testing Materials C-190) and graded Ottawa sand (ASTM C-109). Similar trends in results for the different methods were observed except that the average deviation from the control value of the measured values and the width of the deviation band of the average measured values varied for each method and for each sand. To obtain high accuracy by *in situ* density-testing methods, the equipment should be calibrated by using the controlled densities of the material to be tested. The tube method and the rubber-balloon tube method with either a 3-in.- or a 5-in.-D tube of 6 in. in length exhibited narrow bands of deviation for the standard sands. The wedge method is not recommended for measurement because of interference between the sand particles and the plate intersections. The plastic-injection method has no outstanding merit for *in situ* density measurement, but it can provide comparatively undisturbed samples for grain relationship studies. The use of sand funnels (particularly the small sand-funnel tube and the large sand funnel) did not produce accurate results because of the large width of the deviation band. A literature study of irradiation methods revealed that the

methods are not superior to the tube method or the rubber-balloon tube method in accuracy or in feasibility for field use. (ASTIA)

383. SEDIMENT SAMPLING IN TIDAL WATERWAYS  
Schultz, E. A.  
*American Society of Civil Engineers, Proceeding of the*, v. 80, no. 427, pp. 1-11, March 1954

384. INVESTIGATION OF FURTHER USEFULNESS OF THE MARK II SOIL TRUSS WITH CONTROLLED RATE OF SHEAR  
Harroun, D. T.  
December 1954  
Pennsylvania University, School of Civil Engineering, Philadelphia  
Report, NOy-73519  
AD-78,703

A discussion is given of the development and testing of the additional changes to the Mark II soil truss. The specific aim is to provide a technique for obtaining the standard soil characteristics of frictional resistance and cohesion. Tests indicated the absence of any frictional lag when the truss joints are carefully cleaned and oiled. The residual couple caused by a  $\frac{3}{4}$ -in. eccentricity in the pantograph construction of the truss was eliminated by offsetting the shear and anchor shoes to the centerline of the truss. A shear rate control device was developed for the truss to insure a constant rate of shearing displacement at the shear shoe and to eliminate the human equation of the operator. This device consisted of a pac-ing dial geared to the movement of the loading handle, which can be synchronized with the moving hand of a stop watch. A correlation curve was developed which shows the relation between soil truss cohesion values at 30 in./min vs. standard laboratory shear tests run at 0.05 in./min. Field tests were made on 20 different sites, covering all typical soil types such as beach sand, swampy muck, plastic clays, and firm residual sandy clay. (ASTIA)

385. EFFECT OF SAMPLE DISTURBANCE ON THE STRENGTH OF A CLAY  
Calhoon, M. L.  
*American Society of Civil Engineers, Proceedings of the*, v. 80, no. 570, pp. 1-16, December 1954; (discussion) v. 81, no. 843, pp. 9-14, December 1955

386. PROPERTY STUDIES OF ALASKAN SILTS IN THE MATANUSKA VALLEY, BIG DELTA, AND FAIRBANKS AREAS  
Stump, R. W., Handy, R. L., et al.  
December 1, 1955  
Iowa Engineering Experiment Station, Ames Progress Report for June 1, 1954-June 1, 1955, Nonr-53004  
AD-81,843

The study of four Alaskan areas (Matanuska Valley, Big Delta, Fairbanks, and Point Barrow) was initiated to determine (1) the distribution of engineering soil materials in the areas, (2) the engineering properties and trafficability characteristics of the materials, and (3) the feasibility and best methods of stabilizing the materials for use as road and airfield building material. Only the first three regions are considered. The silts overlie glacial and alluvial deposits in the Matanuska Valley as a surficial deposit. The thickest silts measured were north of Palmer; the thickness decreases west of the Matanuska River toward the south and west.

Particle size decreases with decreasing thickness and shows little variation vertically except in the basal portion where the material is usually much coarser. Five or six volcanic ash layers are present in the thick silt, but only remnants were found in the thin silt sections. Mechanical analyses and consistency limits of 91 samples showed that 92% classified texturally as silty loam; the plasticity index averaged 3.54. The principal silt deposits in the Big Delta region lie on terraces. The silts, which thin eastward away from the Delta River, are highly micaeous and texturally average 14.1% sand and 8.91% clay for 40 samples. The Fairbanks silts, which are a surficial deposit found on the hills rising north and west of Fairbanks, are also micaeous, but are finer grained. Mechanical analyses of 28 samples gave averages of 2.41% sand and 11.54% clay. (ASTIA)

387. SOIL-MOISTURE MEASUREMENT  
Lull, H. W., Reinhart, K. G.  
1955  
U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, La.  
Occasional Paper 140

In agriculture, forestry, and engineering, considerable attention is devoted to the amount of moisture in the soil and its influence on such factors as crop yields, forest

growth, and soil strength. Because of the importance of soil-moisture records and difficulties in securing them, considerable time and energy have been spent in developing new ways of measuring moisture. This paper reviews most of these methods, describes and compares the most commonly used instruments, and discusses soil-moisture expression, variation, and sampling.

388. SOIL STABILIZATION FOR THE CONSTRUCTION OF ROADS AND AIRFIELDS, PART I. BIBLIOGRAPHY

Neeb, J. F., Compiler

May 11, 1956

Technisch Documentatie Centrum voor de Krijgsmacht, Netherlands

Report TDCK 7343

AD-100,253

A bibliography is presented which covers a period from 1948 to 1955 and which contains 70 titles of American literature on soil stabilization for the construction of roads and airfields. The chapters are: (1) Handbooks on Soil Mechanics; (2) Stabilization—General; (3) Testing and Evaluation of Soils; (4) Mechanical Soil Stabilization; (5) Cement Soil Stabilization; (6) Bituminous Soil Stabilization; (7) Chemical Soil Stabilization; (8) Electro-osmotic Soil Stabilization; and (9) Equipment. (ASTIA)

389. SOIL STABILIZATION FOR THE CONSTRUCTION OF ROADS AND AIRFIELDS. PART II, BIBLIOGRAPHY

Neeb, J. F., Compiler

May 11, 1956

Technisch Documentatie Centrum voor de Krijgsmacht, Netherlands

Report TDCK 7344

AD-100,254

A bibliography is presented which covers the period from 1947 to 1956 and which contains 108 titles and abstracts of non-American literature on soil stabilization for the construction of roads and airfields. The chapter headings are the same as in the previous report. (ASTIA)

390. SOIL AS A NATURAL RESERVOIR FOR HUMAN PATHOGENIC FUNGI

Ajello, L.

Science, v. 123, pp. 876–879, May 18, 1956

391. IN-PLACE DENSITY TESTS OF MONTALVO BASE COURSE MATERIAL UNDER CONTROLLED CONDITIONS  
Griffin, D. F.  
June 30, 1956  
University of Southern California, Engineering Center, Los Angeles  
Final Report USCEC 52-101, NBy-3101  
AD-107,423

An investigation was made of the accuracy with which in-place densities of Montalvo base course materials can be measured. The sand jug and cone apparatus was used to determine volumes of cavities from which base course material was excavated. The accuracy of the sand cone apparatus *per se* was evaluated and found to be consistently of a high order, even in rough cavities. In-place density tests were made in a box of known volume with the material placed at various densities and water contents. A minimum of four tests was used to control or determine the true average density of a given soil mass. Tests showed that the Montalvo material is sensitive to changes in volume and that the degree of sensitivity depends upon the water content. The error in measuring in-place densities was large. The widths of the deviation bands were considered great enough to raise doubts as to the validity of in-place field density measurements made without recognition of the limitations of accuracy possible, even with benefit of calibration data based on in-place density tests made under controlled conditions. The over-all trend of error for in-place density measurements of Montalvo base course material was an algebraic increase in percent error of measured density with an increase in control densities, a trend opposite to that previously reported (AD-79,282) for cohesionless sands. Optimum water content for compaction of Montalvo base course material for good bearing values ranged from 4 to 6%. (ASTIA)

392. EFFECT ON SOIL COMPACTION OF TIRE PRESSURE AND NUMBER OF COVERAGES OF RUBBER-TIRED ROLLERS AND FOOT-CONTACT PRESSURE OF SHEEPSFOOT ROLLERS

Burns, C. D.

June 1956

U.S. Army, Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss.

Report 7 on Soil Compaction Investigation, Technical Memorandum 3-271

AD-105,204

This report presents the results of a field and laboratory study of the effects of tire pressure and number of coverages of rubber-tired rollers and foot-contact pressure of sheepsfoot rollers on the compaction and stress-strain characteristics of a lean-clay soil. Test fills were constructed using a rubber-tired roller, with tire pressure ranging from 50 to 150 psi and compacted by 4 to 16 coverages, and a sheepsfoot roller with 14-in.<sup>2</sup> feet loaded to produce nominal foot-contact pressure of 125 and 375 psi. Laboratory- and field-compacted samples of the clay were subjected to water content, density, CBR, and triaxial shear tests. It was found that increasing the number of coverages or tire pressure of a rubber-tired roller, within the limits used in this study, results in higher maximum densities at lower optimum water contents. Increase in density results in (1) increase in strength where the soil water content is dry of the optimum for the highest compaction effort used, and (2) decrease in strength where the soil water content is wet of optimum. Increasing the foot pressure of the sheepsfoot roller used had little effect on the degree of compaction or strength obtained in the test soil. (ASTIA)

393. SOIL STABILIZATION FOR THE CONSTRUCTION OF ROADS AND AIRFIELDS, PART IIa, BIBLIOGRAPHY

Grevink, H., Compiler

November 27, 1956

Technisch Documentatie Centrum voor de Krijgsmacht, Netherlands  
Report TDCK 7344-51 (Supplement to Report TDCK 7344)  
AD-119,480

This bibliography comprises the following sections: (1) Handbooks on Soil Mechanics, (2) Stabilization—General, (3) Testing and Evaluation of the Soils, (4) Mechanical Soil Stabilization, (5) Cement Soil Stabilization, (6) Bituminous Soil Stabilization, (7) Chemical Soil Stabilization, (8) Electro-Osmotic Soil Stabilization, (9) Equipment (10) Indexes, and (11) Bibliographies.

394. ENGINEERING TESTS ON MOBILE MATERIALS LABORATORY M-II

Mitchell, J. E.

November 1956

U.S. Army, Corps of Engineers, Waterways Experiment Station, Vicksburg, Miss.  
Technical Report 3-442  
AD-118,919

Soils, asphalt, and concrete tests were performed in the Mobile Materials Laboratory M-II using the testing procedures as given in Department of the Army TM 5-530, *Materials Testing*. The results of these tests were then compared with those obtained on identical materials in a permanent laboratory. Agreement of results was found to be good. The equipment and arrangement of the Mobile Materials Laboratory M-II were found to be generally satisfactory; however, numerous relatively minor revisions would make the laboratory more efficient and convenient. (ASTIA)

395. SAMPLER HANDLES SOLIDS-CARRYING STREAMS

Leonard, E. F.

*Chemical Engineering*, v. 63, pp. 218, 220, December 1956

396. PROPERTIES OF 91 SOUTHERN SOIL SERIES

Doss, B. D., Broadfoot, W. M.

1956

U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, La.  
Occasional Paper 147  
AD-104,511

Samples of 91 soil series in seven southern states (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, and Tennessee) were collected and analyzed from June 1954 to July 1955 to supply the U.S. Army with information needed for research on military trafficability. The 91 series are typical of the soils in the Gulf Coastal Plain and the Lower Mississippi Valley; samples were taken at 176 sites. The soil properties were determined from bulk samples and 2-in. cores taken randomly from a 12- by 18-ft plot at each site. Bulk samples, composited from six locations, were taken from the 0- to 6-, 6- to 12-, and 12- to 18-in. layers for determination of mechanical analysis, plasticity constants, and organic-matter content. No samples were taken below 18 in. Mechanical composition was determined by a combination sieve and hydrometer method. Separation of medium- from fine-sized particles was based on Bouyoucos hydrometer readings taken only 1 hr after the suspension was mixed and adjusted to a pH=9.5 with 0.01N NaOH. Medium- and fine-sized particles are reported as silt and clay, respectively. Organic-matter determinations were made by a modified Walkley rapid-dichromate oxidation method (U.S. Dept. of Agriculture Circular 757, 1947). The loss-on-ignition method

(Methods of Analysis, Association of Official Agricultural Chemists, 6th Edition, 1945) was used for samples when the organic-matter content was determined as over 5% by the Walkley method. Plasticity constants of the 6- to 12-in. layers were determined. (Soils Laboratory Manual, Section 111, Mechanical Analysis, 1951). Bulk density and tension analysis were determined from 2-in. cores obtained with the modified San Dimas or drive-type sampler (Southern Forest Experimental Station Occasional Paper 135, 1954). (ASTIA)

397. APPLICATION OF A METHOD OF GAS MICROANALYSIS TO THE STUDY OF SOIL AIR  
Hack, H. R. B.  
*Soil Science*, v. 82, pp. 217-231, 1956

A micromethod for 0.01-cc samples uses a hypodermic syringe inserted through a plastic sheet. At appreciable depths in compact soil, results are influenced by compaction.

398. A DIFFERENTIAL THERMAL ANALYSIS OF SOIL HUMUS  
Iri, H.  
*Soil and Plant Food*, Tokyo, v. 2, pp. 33-34, 1956

399. DETERMINING HUMUS IN SOIL  
Maton, A., Cottenie, A. H., van den Hende, A.  
*Mededelingen van de Landbouwhogeschool en de Opzoekingsstations van de Staat te Gent*, Belgium, v. 21, pp. 175-193, 1956

Twenty-one soil samples were analyzed four times by six methods: (1) Loss in weight upon calcining ( $a\%$ ),  $\text{CO}_2$  ( $b\%$ ), and  $\text{H}_2\text{O}$  ( $c\%$ ) were determined. Humus =  $(a - b - c)\%$ . (2) C was oxidized with  $N \text{K}_2\text{Cr}_2\text{O}_7$ , according to Walkley and Black. (3) C was oxidized with 0.1N  $\text{Ce}(\text{SO}_4)_2$  according to Rubia Pacheco and López-Rubio. (4) C was oxidized with 0.1N  $\text{KMnO}_4$  according to Iitscherekow. (5) C was oxidized with 8%  $\text{K}_2\text{Cr}_2\text{O}_7$  according to Anne. (6) The colorimetric method of Riehm and Ulrich was modified: pulverized soil was treated with concentrated  $\text{H}_2\text{SO}_4$ , then by  $\text{K}_2\text{Cr}_2\text{O}_7$ , and heated at  $120^\circ$  for 90 min; after cooling, a predetermined amount of  $\text{H}_2\text{O}$  was added; subsequently, the mixture was centrifuged and extinction determined at  $600 \text{ m}\mu$ . The method was calibrated by determining C by elementary analysis. Results of the six methods are compared with those of elementary analysis.

400. DETERMINATION OF ORGANIC MATTER IN SAND  
Ryabov, L. I.  
*Stroitel'naya Promyshlennost*, v. 34, no. 2, pp. 37-38, 1956

The test proposed is a comparison of the mechanical strength of sand baked at  $100-150^\circ \text{C}$  (to decompose the acids) with that of unbaked sand.

401. CONDUCTOMETRIC DETERMINATION OF CARBON  
Torok, L.  
*Agrokémia és Talajtan*, Hungary, v. 5, pp. 257-266, 1956

Carbon is oxidized and the  $\text{CO}_2$  absorbed in  $\text{Ba}(\text{OH})_2$  solution. Resistance is measured with a Wheatstone bridge.

402. RAPID TECHNIQUES FOR THE ANALYSIS OF SOILS  
Zaffanella, M. J. R.  
*Revista de investigaciones agricolas*, Argentina, v. 10, pp. 5-34, 1956

Rapid techniques are described for determination of organic material, N, insoluble carbonates, etc. Results of such analysis were compared with results of actual growing tests.

403. SEDIMENTARY CHARACTERISTICS OF DUST STORMS, SORTING OF WIND-ERODED SOIL MATERIAL  
Chepil, W. S.  
*American Journal of Science*, v. 255, pp. 12-22, January 1957

404. REVERSING FOREIGN AID: SOIL SAMPLES FOR ANTIBIOTIC RESEARCH  
*Chemical Week*, v. 80, p. 90, February 16, 1957

405. GEOCHEMICAL PROSPECTING IN CHIBOUGAMAU  
Ermengen, S. V.  
*Canadian Mining Journal*, v. 78, no. 4, pp. 99-104, April 1957

The copper-zinc deposit of Chibougamau, Quebec, was surveyed using soil sampling and limited amount of water testing near main mineral deposit. The analytical technique, soil sampling tools, and sample containers are described. There is heavy metals distribution in soil profile in the background area, and in the vicinity of mineralized bedrock. The regional distribution of heavy metals in soil and humus is shown. (*EI*, 1958)

**406. SMALL DRY BOX FOR SAMPLING**

Fiebig, E. C., Spencer, E. L., McCoy, R. N.  
*Analytical Chemistry*, v. 29, p. 861, May 1957

**407. OPROBOVANIE EKSPLUATATSIONNYKH SKVAZHIN NA MAGNITEGORSKOM RUDNIKE (SAMPLING OF SHOTHOLES IN MAGNITOGORSK MINE)**

Mogilevskii, G. B.  
*Gornyi Zhurnal*, v. 132, no. 5, pp. 32-35, May 1957

The method of sampling, determination of possible errors during sampling, and dependence of iron content upon size of particles in drilling slime and stage of bailing out hole are discussed. (*EI*, 1959)

**408. FOR LAB OR FIELD USE: HAND-OPERATED COMPACTOR PREPARES SOIL SAMPLES**

*Engineering News-Record*, v. 159, p. 318, October 17, 1957

**409. FOUNDATIONS FOR MILL CONSTRUCTION ON CLAY AND PERMAFROST**

Bronson, E. H.  
*Mining Engineering*, v. 9, no. 11, pp. 1262-1267, November 1957

Structural problems are discussed which were encountered in building a mining plant situated in the great clay belt in the northern part of the Province of Quebec. Testing by auger, laboratory testing of soil samples, calculation of the bearing capacity of silt, and the influence of vibration on clay are covered. (*EI*, 1958)

**410. SAMPLING PROGRAMMES AND SAMPLING INSTRUMENTS IN COAL MINES**

[ABSTRACT]

Tomlinson, R. C.

*Journal of Scientific Instruments*, v. 34, pp. 425-426, November 1957

**411. NEW SAMPLER SPEEDS DESIGN OF 31,000,000-CU YD FILL**

Anderson, H. V.

*Civil Engineering*, v. 29, no. 12, pp. 40-43, December 1957

The sampler used in construction of the Great Salt Lake Trestle is described. The principle of the sampler is to insulate the core and protect it from sampler wall by means of thin axial metal foils. The upper ends of foils are attached to a piston brake mechanism above the core; the lower ends unwind from 16 different rolls which are held in sampler head. Foils are pulled through guides and follow up along the perimeter of the core. (*EI*, 1958)

**412. SYMPOSIUM ON VANE SHEAR TESTING OF SOILS**

1957

American Society for Testing Materials, Philadelphia, Pa.  
Special Technical Publication 193

At this symposium in Philadelphia, Pa., June 22, 1956, the following papers were presented: "Introduction," by J. O. Osterberg; "Apparatus and Method of Vane Shear Testing of Soils," by H. J. Gibbs; "Deep Vane Tests in Gulf of Mexico," by C. W. Fenske; "Vane In-Place Soil Shear Device Developed and Applied by Oregon State Highway Department," by W. C. Hill; "Use of Field Vane Apparatus in Sensitive Clay," by W. J. Eden and J. J. Hamilton. (*EI*, 1958)

**413. CHEMICAL AND PHYSICOCHEMICAL PROPERTIES OF SOIL HUMIC COLLOIDS. III. EXTRACTION OF ORGANIC MATTER FROM SOILS**

Choudhri, M. B., Stevenson, F. J.

*Soil Science Society of America, Proceedings of the*, v. 21, pp. 508-513, 1957

The proportion of humic acid N extracted to total organic N extracted was higher in 0.15M Na<sub>4</sub>P<sub>2</sub>O<sub>7</sub> extracts than in those of other reagents. Methods for removal of silicate minerals and O prior to extraction of humic acids were proposed as aids to extraction.

**414. NEW APPROACH TO DETERMINATION OF SHEAR STRENGTH OF CLAY BY FALL-CONE TEST**

Hansbo, S.

*Royal Swedish Geotechnical Institute, Proceedings of the*, no. 14, 1957

The region of failure created around a cone when dropped into clay is studied both theoretically and experimentally. Investigation of cone motion has also been carried out. The relation is established between depth of cone penetration and undrained shear strength of clay. (EI, 1958)

**415. ORGANIC INGREDIENTS OF SOILS.**

**I. DETERMINATION OF THE ORGANIC CARBON CONTENT OF SOILS AND HUMUS EXTRACTS**

Sarkadi, J.

*Agrokémia és Talajtan*, Hungary, v. 6, pp. 311-319, 1957

A modification of Schollenberger's method is described. The chemical method is fairly accurate. Improved sampling may provide more homogeneity of the sample.

**416. COLORIMETRIC METHOD FOR THE DETERMINATION OF NITROGEN IN SOIL AND IN PLANTS**

Shchetinina, L. L., Butenko, V. A.

*Pochvovedenie*, 1957, no. 8, pp. 98-101, 1957

**417. CHEMICAL DETERMINATION OF SOIL ORGANIC MATTER**

Silfverberg, L.

*Royal Swedish Geotechnical Institute, Proceedings of the*, no. 15, 1957

Chemical constitution of soil organic matter, stage of destruction of organic material, and direct and indirect methods with regard to difficulties in determining relatively small amounts of organic matter in clays and other fine grained soils are considered. The results of testing methods on their usefulness for geotechnical purposes are presented. (EI, 1958)

**418. USE OF PHENYLANTHRANILIC ACID IN HUMUS DETERMINATION BY THE**

**I. V. TYURIN METHOD**

Simakov, V. N.

*Pochvovedenie*, 1957, no. 8, pp. 72-73, 1957

**419. ON YIELDING OF SOILS**

Roscoe, K. H., Schofield, A. N., Wroth, C. P.

*Géotechnique*, v. 8, no. 1, pp. 22-53, March 1958

Hvorslev's equation for shear strength of clay is shown to define surface in space of three variables. Paths taken by samples in differing tests can be correlated if boundary energy correction is applied. At the critical voids ratio state, unlimited deformation can take place while variables remain constant. Analysis is made of the results of triaxial tests on clay and on silt and sand. Tests are conducted on granular media in simple shear apparatus. (EI, 1958)

**420. A CRITICAL REVIEW OF SELECTED LITERATURE RELATING TO THE VIBRATORY CUTTING, PENETRATION AND COMPACTION OF SOILS**

Cowin, S. C., Kondner, R. L., Ayre, R. S.

April 1, 1958

Johns Hopkins University, Baltimore, Md.

TR 4, DA 22-079-eng-210

AD-200,148

This is a review of the literature in soil mechanics, soil physics, engineering and agriculture, relating to the vibratory cutting, penetration and compaction of soils. The literature references were previously collected and reported in Bibliography Relating to Vibratory Cutting, Penetration and Compaction of Soils, and Supplement thereto (AD-160,028, AD-200,147). However, some new material is used in this review. A bibliography contains all the references used, which were selected on the basis of outstanding and/or historical interest, or as typical examples of the literature. The order of this discussion is from the general literature to the specific reference dealing with a subject of the review. Thus, the discussions of soil behavior under dynamic loading and soil-problem modeling are followed by the discussions of vibratory cutting, penetration and compaction of soil. A review of the literature on vibrated concrete that may be of interest to the principal subjects is included. (ASTIA)

**421. IN-PLACE DENSITY TESTS OF COHESION-LESS COARSE-GRAIN BASE-COURSE MATERIAL**

Griffin, D. F.

*ASTM Bulletin*, no. 230, pp. 31-38, May 1958

The evaluation of sand cone apparatus to measure in-place densities of soils is discussed. Data for Montalvo base course material from the bed of Santa Clara River near Montalvo, Calif., which is essentially a cohesionless mixture of rock and sand, are presented. (EI, 1958)

422. DON'T IGNORE SOIL STUDIES

Morris, M. D.

*Public Works*, v. 89, no. 5, pp. 112–119, 177–181,  
May 1958

Papers from a symposium on practical applications of soil behavior include the following: "Foundation Explorations, Drilling and Sampling," by D. M. Greer, pages 112–113; "Role of Soils Testing," by P. C. Rutledge, pages 113–114; "Engineering in Construction Control," by J. D. Welch, pages 114–115; "Equipment for Soils Studies," by M. D. Morris, page 115; "Soil Tests and Highway Location, Design and Construction," by T. D. Lewis, pages 115–116; "California Bearing Ratio Test," by O. J. Porter, page 116; "Soils Studies for Piles," by G. Wheeler, page 116; "Soils Studies Prior to Bridge Construction," by T. R. Dames, pages 117–118; "In Planning for Tunnels, Use Soils Studies," by O. Singstad, page 118; "Soil Investigations for Earth Dam Design and Construction," by H. G. Holtz, pages 118–119; "Soils Studies for Design and Construction of Buildings," by S. M. Olko and H. A. Olko, pages 119, 177; "What's New in Soils Stabilization," by T. W. Lambe, pages 177–179; "Application of Aerial Photographic Interpretation to Engineering Soils Studies," by D. R. Lueder, pages 179–181. (*EI*, 1958)

423. SOIL SAMPLING

Bichan, W. J.

*Canadian Mining Journal*, v. 79, no. 6, pp. 81–87,  
June 1958

Field procedures and costs, and comparative merits of different methods of geochemical soil analysis are given. Patterns and methods of sampling soils are described as well as overburden over ore body. (*EI*, 1959)

424. FUNDAMENTALS OF GEOCHEMISTRY

Nagy, B.

*Oil and Gas Journal*, v. 56, no. 26, pp. 126–128,  
June 30, 1958; no. 28, pp. 155–156, 158–160,  
July 14, 1958; no. 30, pp. 265–266, 269, July  
28, 1958; no. 32, pp. 146–148, 151, August 11,  
1958; no. 34, pp. 132–133, 136–139,  
August 25, 1958

Evolution of organic compounds in primitive earth, modern principles of development of sedimentary rocks, the effect of climatic variations on development of sedimentary rocks and of organic deposits, and the physics and chemistry of the sedimentary basin are discussed. Microbial chemistry of soils and the application of geochemical methods to research for oil and gas are considered. (*EI*, 1958)

425. AMPHIBIOUS RIG SAMPLES SOILS

*Engineering News-Record*, v. 161, p. 106,  
September 18, 1958

426. SOIL BEHAVIOUR DURING SHEAR

Wroth, C. P.

*Engineering*, v. 186, no. 4829, pp. 409–413,  
September 26, 1958

Equations of M. J. Hvorslev for shear strength of saturated remolded clay are discussed. The method of presenting results in three-dimensional form can be extended to cover the case of standard triaxial machines using three comparable parameters. For all tests except drained ones on heavily overconsolidated clays or dense sands, the peak-applied shear stress can be accurately estimated. (*EI*, 1958)

427. THE CHARACTERISTIC OF ORGANIC MATTER IN NEW SOIL FORMATION

Cherepanova, M. N.

*Doklady Moskovskoi Selskokhoziaistvennoi Akademii Imeni K. A. Timiriazeva, Nauchnyy Konferentsii*, no. 34, pp. 160–164, 1958

It is shown that the accumulation of humic acid and humus in soils depends upon the formation process. Methods are described for extraction and separation of compounds from organic matter.

428. CHEMICALS, HUMUS, AND THE SOIL

Hopkins, D. P.

Chemical Publishing Company, Inc., New York,  
N.Y., 1958

429. SOIL CHEMICAL ANALYSIS

Jackson, M. L.

Prentice-Hall, Inc., New York, N.Y., 1958

430. MECHANICAL DISTURBANCES IN CLAY SAMPLES TAKEN WITH PISTON SAMPLERS

Kallstenius, T.

*Royal Swedish Geotechnical Institute of Stockholm, Proceedings of the*, no. 16, 1958

A comparison made between six current types of piston sampler in deep layer of post-glacial clay indicates that sample quality is mainly influenced by sampler in the following ways: disturbances of soil inside and outside sampler are caused by friction between soil and sampler wall, and outside disturbances are caused by displacement. Corrective methods are given. (*EI*, 1959)

431. THE EXTRACTION OF HUMIC SUBSTANCES FROM VARIOUS SOILS

Kretschmer, H.

*Wissenschaftliche Abhandlungen der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin*, Germany, no. 37, pp. 224–225, 1958

Partial and total extractions are compared. A 1% solution of NaOH is used, and photometric examination is made.

432. EVALUATION OF VARIOUS METHODS FOR THE DETERMINATION OF ORGANIC CARBON AND DEGREE OF REDUCTION OF THE ORGANIC MATTER

Messineva, M. A.

*Geologija Nefti, Prilozhenie*, USSR, v. 2, no. 8, pp. 123–136, 1958

Gravimetric and volumetric methods were used in addition to titration with  $K_2Cr_2O_7$ .

433. CHROMATOGRAPHIC ANALYSIS OF HUMUS

Mikhzewski, S.

*Zeszyty Naukowe Wydziały Szkoly Rolniczej, Wroder, Rolnictwo*, no. 6, pp. 120–125, 1958

Five zones were found in all samples of soils. The height of one zone was proportional to the C content in the sample.

434. HUMUS OF BLACK VOLCANIC ASH SOIL

Shinagawa, A.

*Kagoshima Daigaku Nôgakubu Gakujutsu Hôkoku*, no. 7, pp. 172–176, 1958

Two kinds of humic acid from soils of old and more recent eruptions are compared by absorption spectra (IR through UV), X-ray diffraction, C/H and C/N ratios, and methoxyl content.

435. GEOCHEMICAL STUDY OF SOIL CONTAMINATION IN THE COEUR D'ALENE DISTRICT, SHOSHONE COUNTY, IDAHO

Canney, F. G.

*Mining Engineering*, v. 11, pp. 205–210, February 1959

Soil sampling is included.

436. SYMPOSIUM ON APPLICATIONS OF SOIL TESTING IN HIGHWAY DESIGN AND CONSTRUCTION

May 1959

American Society for Testing and Materials, Philadelphia, Pa.

Technical Publication 239

Included are discussions on the following topics: "Examples of Highway Soil Engineering," by E. S. Barber, pages 3–25; "Experience with Core Drilling Machines, Power Augers, and Electrical Resistivity on Pennsylvania Turnpike," by D. G. Shurig and E. J. Yoder, pages 26–45; "Soil Exploration and Mapping Cooperative Project in Illinois," by N. Chryssafopoulos, pages 46–54; "Investigation of Banded Sediments Along St. Lawrence North Shore in Quebec," by R. W. J. Poyer and K. B. Woods, pages 55–69, (discussion) pages 70–73; "Value of Soil Test Data in Local and Regional Road Planning," by M. Ekse, pages 74–88; "Laboratory Methods of Compacting Granular Soils," by E. J. Felt, pages 89–110; "Ohio's Typical Moisture-Density Curves," by J. G. Joslin, pages 111–118; and "Index of Compaction Characteristics," by J. L. McRae, pages 119–123, (discussion) pages 124–127. (EI, 1959)

437. CONGRESO PANAMERICANO DE MECHANICA DE SUELOS Y CIMENTACIONES 1st—MEMORIA 1959 (PROCEEDINGS OF FIRST PANAMERICAN CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING IN MEXICO CITY, SEPTEMBER 1959)

Panamerican Congress, Mexico, D. F.

About 50 papers in English and Spanish are included. (EI, 1961)

438. STATISTICAL STUDY OF SOIL SAMPLING

Thornburn, T. H., Larsen, W. R.

*American Society of Civil Engineers, Proceedings of the*, v. 85 [SM5 (*Journal of the Soil Mechanics and Foundations Division*), paper 2210], pp. 1–13, October 1959; (discussion by J. A. Focht, Jr.) v. 86 [SM2, paper 2459], p. 105, April 1960; (reply) v. 86 [SM6, paper 2696], pp. 87–88, December 1960

439. SUBSURFACE EXPLORATIONS IN PERMAFROST AREAS

Cass, J. R., Jr.

*American Society of Civil Engineers, Proceedings of the*, v. 85 [SM5, paper 2212], pp. 31–41, October 1959; (discussion) v. 86 [SM3, paper 2538], pp. 63–67, June 1960

440. SAMPLING DEVICES FOR WATER AND SOIL

Merritt, W. F., Parsons, P. J.

In "Disposal of Radioactive Wastes. Conference Proceedings, Monaco, November 16-21, 1959, Volume II," pp. 329-338

International Atomic Energy Agency, Vienna

Movement of radioactivity below ground is monitored at Chalk River by several methods. Sealed aluminum pipes are set in the ground down to the glacial till. A battery-operated Geiger counter is lowered down the pipe on a cable. It can detect activity of 20 to 50 dpm/ml dissolved in ground water. A portable  $\gamma$ -ray spectrometer is being developed for use in these dry wells. Ground water is sampled at fixed depths by Alundum thimbles connected to the surface by polythene tubing. Samples are withdrawn into an evacuated flask. Several thimbles can be taped to a rod that is positioned inside a casing driven to the required depth; the casing is then withdrawn, leaving the thimbles in position in the soil. Porous bronze piezometers can be pressed or driven to any depth in the absence of rock. Water passes freely through the bronze and is withdrawn into an evacuated flask. Multiple samples of soil may be taken at a series of preselected depths in one hole by samplers set inside connected section of drill rod. Each sampler is a hollow rod pierced by slits which are closed during drilling by a piston. For sampling, the piston is slightly withdrawn and the rod twisted. A second piston, attached to the first, is then drawn up to close the slots and the string of samplers is lifted from the hole. Undisturbed samples of sand are taken below the water table by a sampler containing an air bell which enables the sample to be withdrawn into an air cavity and be held in the tube by air pressure while the sampler is being brought to the surface. (NSA, 1961, #3759)

441. METHOD FOR OBTAINING SOIL-SAMPLE VOLUMES IN STONY SOILS

McLintock, T. F.

*Journal of Forestry*, v. 57, no. 11, pp. 832-834, November 1959

Recent studies of soil properties in the spruce-fir region of Maine indicate that the sand-pit method of obtaining soil samples of known volume is superior to any other system. Plaster cast, fluid, and sand methods of testing are described. (EI, 1960)

442. UNDRAINED STRENGTH OF COMPACTED CLAYS AFTER SOAKING

Seed, H. B., Chan, C. K.

*American Society of Civil Engineers, Proceedings of the*, v. 85, pt. 1 [SM6, paper 2293], pp. 31-47, December 1959

Effects of soil structure, molding water content, the method of compaction on strength of compacted clay after soaking, and the relationships between initial composition and strength after soaking are discussed. (EI, 1961)

443. STRONTIUM 90 DISTRIBUTION AS DETERMINED BY THE ANALYSIS OF SOILS

Alexander, L. T.

In "Fallout From Nuclear Weapons Tests, Volume I," pp. 278-371

Joint Committee on Atomic Energy, Washington, D.C., 1959

(Available from U.S. Government Printing Office, Washington, D.C.)

Most strontium-90 reaches the surface of the Earth in the water brought down from the air by rain and snow. Most soils retain strontium-90 against leaching by rain water in the same way that they retain the plant nutrient element calcium. There is a gradual movement of the element downward in proportion to the amount of water passing through the soil into the ground water. The process is very slow and even in areas of high rainfall it takes several years to move strontium-90 downward a few inches. Because of this retention, properly selected soils can give a good integrated value of the strontium-90 that has fallen to the ground in a selected location. A worldwide soil sampling program has been carried out to determine how much strontium-90 has reached the surface of the earth in the various latitudes and rainfall belts. Sampling and analytical procedures are discussed. Data are tabulated on the strontium-90 values for samples collected during 1958. Data are included on the total precipitation in each region from 1953 through 1958. (NSA, 1960, #6114)

444. COMPARISON OF SEVERAL METHODS FOR THE DETERMINATION OF ORGANIC CARBON IN SOILS

Boratyński, K., Roszyk, E.

*Zeitschrift Pflanzenernährung Düngung Bodenkunde*, v. 84, pp. 133-137, 1959

Four chromic acid methods and one permanganate method are compared on 49 different surface soils.

445. RELATION OF WALKLEY AND BLACK VALUES TO ORGANIC CARBON IN INDIAN SOILS

Dewan, R. S., Sen, A., Rewari, R. B.

*Indian Society of Soil Science, Journal of the*, v. 7, pp. 103–113, 1959

Some 300 surface soils were examined by the chromic acid method and the dry combustion method, and a correlation in the values sought. It was concluded that a factor used to calculate organic C from Walkley and Black values should be higher for soils containing carbonates. Eight references.

446. SPECTROPHOTOMETRIC METHOD OF DETERMINING THE QUANTITIES OF HUMIC ACIDS IN PEATS AND PEAT-BOG BOILS

Drozdova, T. V.

*Pochvovedenie*, 1959, no. 7, pp. 81–84, 1959

The Tyurin method and the more rapid Welte method give similar results.

447. A NEW METHOD FOR CONTINUOUS DETERMINATION OF CARBON AND NITROGEN IN ORGANIC MATTER

Tú Jang Hsüeh Pao, v. 6, pp. 262–265, 1959

After heating with 5%  $H_2SO_4$  to destroy carbonates, the soil or fertilizer sample is digested with powdered  $K_2Cr_2O_7$  and concentrated  $H_2SO_4$ .  $CO_2$  evolved from the decomposition of organic matter is washed in 10%  $H_2SO_4$  containing  $Ag_2SO_4$ , and led through a condenser to a standard solution of 0.4N  $Ba(OH)_2$ . The excess  $Ba(OH)_2$  is titrated with 0.1N HCl (phenolphthalein indicator). The milliequivalents of  $Ba(OH)_2$  consumed for the neutralization of  $H_2CO_2$  multiplied by 0.01035 gives the amount of organic matter in g in the sample. The digest is then used for the successive determination of N by the usual distillation method after excess alkali is added.

448. OB OPREDELENII VOZDUKHNASYSH-CHENNOXI VODONASYSHCHENNOXI V PEREKHODNOI ZONE PRI PROSACHIVANIYI VODY V POCHVU (DETERMINATION OF AIR AND WATER SATURATION IN TRANSITION ZONE OF INFILTRATION OF WATER INTO SOIL)

Chernyi, I. A., Chen, C.-S. (Chen Chzhun-Syan)

*Akademiya Nauk SSSR, Izvestiya, Otdelenie Tekhnicheskikh Nauk, Mekhanika i Mashinos-troenie*, no. 1, pp. 54–59, January–February 1960

The expression of two-phase liquid motion in a porous medium without capillary pressure is presented, taking into account bulk forces. (EI, 1961)

449. OB IZLUCHENII UPRUGOI VOLNY PRI SFERICHESKOM VZRYVE V GRUNTE (ON THE EMISSION OF AN ELASTIC WAVE FROM A SPHERICAL EXPLOSION IN THE GROUND)

Zvolinskii, N. V.

*Prikladnaya Matematika i Mekhanika*, v. 24, no. 1, pp. 126–133, January–February 1960

(Translation available in *PMM; Journal of Applied Mathematics and Mechanics*, v. 24, no. 1, pp. 166–176, 1960)

Previous work by the author and others on dynamics of soils is developed further. A study is made of an elastic-plastic medium, depending on the effect of compaction, during which the flow of material in an incompressible state achieves a property similar to internal friction. The propagation of the shock wave is described. (EI, 1961)

450. RHIZOSPHERE

Brown, M. E., Jackson, R. M.

*Chemistry and Industry*, pp. 140–142; (discussion) 142–143, February 6, 1960

Abstracts are given of two papers concerned with soil microorganisms.

451. ON DISTRIBUTION OF PORE WATER PRESSURE IN SOIL DURING ELECTRO-OSMOTIC PROCESS

Mise, T.

*Japan Society of Civil Engineers, Transactions of the*, no. 67, pp. 42–48, March 1960

Several apparatus for measuring pore water pressure in soil were designed and used. According to a new theory presented, variation of distribution of pore water pressure was chiefly caused by junction of pH in soil mass and difference of speed of electro-osmosis between the right side and left side of this zone. (EI, 1961)

452. COMMERCIAL LABORATORY AND ADVISORY PROCEDURES IN SUB-TROPICAL AGRICULTURE

Wolf, B.

*Journal of Agriculture and Food Chemistry*, v. 8, pp. 96-99, March 1960

Soil sampling is considered.

453. AKTIVNOE VOZDEISTVIE NA VERKHNI SLOI POCHVY I VLIYANIE ETOGO FAKTORA NA TEPLOVOI REZHIM EE (ACTIVE EFFECTS ON TOP SOIL AND THEIR INFLUENCE ON ITS TEMPERATURE CONDITIONS)

Chudnovskii, A. F.

*Inzhenerno-Fizicheskii Zhurnal*, v. 3, no. 4, pp. 23-29, April 1960

Determination of the temperature field in soil exposed or not exposed to such effects as crumbling, packing, etc., is discussed. It is assumed that temperature change is sinusoidal about its average daily value at certain height above soil, and that damping is proportional to distance below the surface. (*EI*, 1961)

454. SOIL STRUCTURE AND THE STEP-STRAIN PHENOMENON

Trollope, D. H., Chan, C. K.

*American Society of Civil Engineers, Proceedings of the*, v. 86 [SM2, paper 2431], pp. 1-39, April 1960; (discussion) [SM4, paper 2586], pp. 99-100, August 1960; [SM5, paper 2636], pp. 133-136, October 1960; [SM6, paper 2696], pp. 93-94, December 1960; (reply) v. 87 [SM3, paper 2839], pp. 111-114, June 1961

455. OPREDELLENIE STSEPLENIYA I NESUSH-CHEI SPOSOBNOSTI TORFYANYKH OSNOVANII SFERICHESKIM SHTAMPOM (DETERMINATION OF COHESION AND CRITICAL LOAD OF PEAT SOIL FOUNDATIONS BY MEANS OF SPHERICAL PROBES)

Vinokurov, F. P., Skvortsov, B. P., Teterkin, A. E. *Inzhenerno-Fizicheskii Zhurnal*, v. 3, no. 4 pp. 49-53, April 1960

The results are presented of laboratory and field tests, taking into account relaxation of cohesion forces in time, thus avoiding exaggerations inherent in other methods. (English summary) (*EI*, 1961)

456. DEFORMATION OF SOILS BY GLACIER ICE AND INFLUENCE OF PORE PRESSURES AND PERMAFROST

Mathers, W. H., Mackay, J. R.

*Royal Society of Canada, Transactions of the, Section IV*, v. 64, pp. 27-36, June 1960

Deformation of unconsolidated material by glacier ice seems commonly related to the actively moving ice margin where the surface slope of ice was probably steepest. High pore pressures which developed in soil may have facilitated thrusting by reduction in shear strength of the soils. The presence of permafrost and its aggradation and degradation on land and under sea in relation to shearing strength and development of pore pressures are discussed. (*EI*, 1961)

457. SOIL THERMAL RESISTIVITY STUDIED

*Electrical World*, v. 154, pp. 45-46+, July 18, 1960

458. ELECTRONICS PROBES NATURE; EARTH

Bushor, W. E., Wolff, M. F.

*Electronics*, v. 33, pp. 73-77, July 29, 1960

459. VLIYANIE PEREMENNOGO KHARAKTERA TEPLOFIZICHESKIKH KHARAKTERISTIK POCHV PO IKH PROFILYU NA TEMPERATURU POCHVY (VARIATION OF THERMAL CHARACTERISTICS OF SOILS ACCORDING TO THEIR PROFILE AND ITS EFFECT ON SOIL TEMPERATURE)

Chudnovskii, A. F.

*Inzhenerno-Fizicheskii Zhurnal*, v. 8, no. 7, pp. 51-59, July 1960

The effect of variable thermal characteristics on the temperature field of soil is discussed. A solution of the problem for the case of linear dependence of the heat conductivity coefficient on the depth of soil layer is given. (English summary) (*EI*, 1961)

460. APPAREIL POUR LA MESURE DE LA PERMÉABILITÉ DANS LE TERRAIN EN PLACE (APPARATUS TO MEASURE PERMEABILITY OF SOIL IN THE FIELD)

Brillant, J.

*Genie Civil*, v. 137, no. 15-16, pp. 339-341, August 1-15, 1960

The law of Darcy and the method of Lafranc for testing the permeability of natural soils are cited. The inaccuracy of the testing method is shown. The new apparatus com-

prises a bell-float movable in a tube which is sunk into soil and is attached to a cable by a ball-valve. Extent and speed in seconds of immersion of the bell are registered. The formula for interpretation of results is presented. (EI, 1961)

461. EEN REGISTRERENDE KOMPAS HELLMETER (A RECORDING COMPASS CLINOMETER)

Plankeel, F. H., von der Sluis, J. P.

*Geologie en Mijnbouw*, v. 22, no. 8, pp. 326-329, August, 1960

A continuously recording compass clinometer for use with a punchcorer was developed to obtain orientation of seabottom core samples taken in 1000 m of water by recording compass reading and angle and direction of inclination. (EI, 1961)

462. RESEARCH CONFERENCE ON SHEAR STRENGTH OF COHESIVE SOILS, BOULDER, COLO., JUNE 13-17 [ABSTRACTS OF PAPERS]

*Civil Engineering*, v. 30, p. 104, August 1960

463. STABILIZATION OF POORLY REACTING SOILS

Herzog, A.

*Constructional Review*, v. 33, no. 9, pp. 32-36, September 1960

Compressive testing of soil samples mixed with cement and water after being cured for seven days and submerged in water for four hours is discussed. Tables show the results with various cement ratios. Results with laboratory samples were compared with those of road samples. The use of calcium chloride for improving the response of poorly reacting soils to cement addition is considered. The testing of sodium metasilicate and ferric chloride as alternative additives is suggested. (EI, 1961)

464. MEASUREMENT OF RELATIVE DENSITY OF SAND

Kitago, S., Kozaki, F.

*ASTM Bulletin*, no. 248, pp. 36-40, September 1960

A proposal for a procedure to obtain maximum and minimum densities is derived from the Bureau of Reclamation method. It eliminates special apparatus and highly skilled operators. Work was done in connection with field study on a simplified cone penetration test in deep sand layers to examine the relation between penetration char-

acteristics, shearing strength, and relative density of sand, which necessitated a practical method applicable to cohesionless soil. (EI, 1961)

465. GEOCHEMICAL TECHNIQUES; A REVIEW

Riddell, J. E.

*Canadian Mining and Metallurgical Bulletin*, v. 53, pp. 765-768, October 1960

466. COAL SAMPLER GETS TO BOTTOM OF HEAP

*Electrical World*, v. 154, p. 57, November 28, 1960

467. ROUTINEBESTIMMUNG VON FREIER KIESELSAURE IM PHOSPHORSAEUREAUF-SCHLUSS (ROUTINE DETERMINATION OF FREE SILICIC ACID BY PHOSPHORIC ACID DECOMPOSITION)

Schmidt, K. G.

*Staub*, v. 20, no. 11, pp. 404-411, November 1960

Staubforschungsinstitut (Dust Research Institute) method for determination of free silicic acid in rock and earth substances by use of phosphoric acid decomposition provides the most accurate technique currently available. X-ray analysis may be superior for combustion products. SiC- and fluorine-containing materials are best determined by optical means. (EI, 1961)

468. CORRELATIONS BETWEEN SOIL-MOISTURE DEPLETION, SOLAR RADIATION AND OTHER ENVIRONMENTAL FACTORS

Stearns, F. W., Carlson, C. A.

*Journal of Geophysical Research*, v. 65, no. 11, pp. 3727-3732, November 1960

Data were obtained in upland meadow on loessial soil. The highest correlations of single factors with moisture loss were obtained with soil temperature, evaporation pan data and solar radiation. Values for air temperature, vapor pressure deficit, humidity, and wind were progressively lower. (EI, 1961)

469. OB OSNOVNYKH PREDSTAVLENIYAKH DINAMIKI GRUNTOV (BASIC CONCEPTS IN SOIL DYNAMICS)

Grigoryan, S. S.

*Prikladnaya Matematika i Mekhanika*, v. 24, no. 6, pp. 1057-1072, November-December 1960

(Translation available in *PMM; Journal of Applied Mathematics and Mechanics*, v. 24, no. 6, pp. 1604-1627, 1960)

A detailed evaluation of a mathematical model for describing motion of soil-type media is presented, as well as related thermodynamic problems. (*EI*, 1961)

**470. SOIL COMPACTION AND PROOF-ROLLING OF SUBGRADES**

1960

National Research Council, Highway Research Board, Washington, D.C.

Bulletin 2254

The following papers were presented at the Council's 39th annual meeting held in Washington, D.C., January 11-15, 1960: "Full-Scale Compaction Studies at British Road Research Laboratory," by W. A. Lewis, pages 1-11; "Proof-Rolling of Subgrades," by W. J. Turnbull, and C. R. Foster, pages 12-22; "Hydraulic Fill Compaction," by O. Stokstad, and K. Allemeier, pages 23-29; "Rapid Determination of Liquid Limit of Soils by Flow Index Method," by H. Y. Fang, pages 30-35. (*EI*, 1961)

**471. SOME PREDICTIONS AS TO THE POSSIBLE NATURE AND BEHAVIOR OF THE LUNAR SOILS**

Ryan, J. A.

December 20, 1960

Douglas Aircraft Co., Inc., Santa Monica, Calif. Engineering Paper 1111, presented at the First International Conference on the Mechanics of Soil-Vehicle Systems, Turin, Italy, June 1961

The first manned landings will most likely be made on the Moon. Any anticipation of problems that may be encountered during lunar landings depends on information obtained prior to such landings. To ascertain the possible nature and behavior of lunar soils, the following are presented: (1) a brief description of the lunar surface environment; (2) an outline of present ideas regarding lunar soil characteristics; and (3) consideration of the lunar environmental effects on soil behavior.

**472. COMPUTER SOLUTION OF PRESSURE DISTRIBUTION PROBLEM**

Stoll, U. W.

*American Society of Civil Engineers, Proceedings of the*, v. 86 [SM6, paper 2670], pp. 1-9, December 1960

A general computer method for solving vertical pressure distribution problems encountered in applied soil mechanics is presented. An attempt is made to retain direct equivalence between the physical problem and required computer notation and logic. A possible computer

flow diagram and a specific Fortran program for the computer used are given. (*EI*, 1961)

**473. STRESS CONDITIONS IN TRIAXIAL COMPRESSION**

Balla, A.

*American Society of Civil Engineers, Proceedings of the*, v. 86 [SM6, paper 2684], pp. 57-84, December 1960

Investigation of stresses and deformations occurring in a test specimen during a triaxial compression test is used to determine shearing strength of soil. The influence of end restraint on cylindrical test specimens, exerted by stiff loading plates with any degree of roughness, is considered by the introduction of simplified roughness function. Numerical solutions are given for a test specimen with length-diameter ratio of 2.0 and for maximum roughness of plates. (*EI*, 1961)

**474. WATER FLOW THROUGH SOIL PROFILE AS Affected BY LEAST PERMEABLE LAYER**

Swartzendruber, D.

*Journal of Geophysical Research*, v. 65, no. 12, pp. 4037-4042, December 1960

Water movement through a water-saturated soil profile is analyzed on the basis of Darcy's law for sectionally continuous hydraulic conductivity along one-dimensional, downward flow path. The resulting relationships are used to assess the effect of the least permeable layer on flow through the profile. Hydraulic conductivity of the least permeable layer does not, of itself, control flow. (*EI*, 1961)

**475. WET-COMBUSTION APPARATUS AND PROCEDURE FOR ORGANIC AND INORGANIC CARBON**

Allison, L. E.

*Soil Science Society of America, Proceedings of the*, v. 24, pp. 36-40, 1960

Oxidation of C to CO<sub>2</sub> is followed by passing the CO<sub>2</sub> through KI, Ag<sub>2</sub>SO<sub>4</sub>, concentrated H<sub>2</sub>SO<sub>4</sub>Zn, and anhydride in succession. Thereafter, CO<sub>2</sub> is absorbed on Mikohbite in a Nesbitt bulb and determined by weighing.

**476. SIMPLE, RAPID AUTOMATIC MICRO-DUMAS APPARATUS FOR NITROGEN DETERMINATION**

Gustin, G. M.

*Microchemical Journal*, v. 4, pp. 43-54, 1960

The apparatus is extremely compact and accurate. An absorption chamber of magnetically stirred caustic and a 5-cc measuring syringe are used. Six analyses per hour on organic samples of 1-10 mg can determine N down to the 0.01% level.

**477. RESEARCH AND APPLICATION OF SOIL TESTING FOR ORGANIC SOILS**

Hortenstine, C. C., Forsee, W. T.

*Soil and Crop Science Society of Florida, Proceedings of the*, v. 20, pp. 363-370, 1960

**478. EXPERIMENTAL INVESTIGATION OF STOCHASTIC DISCONTINUOUSLY NON-HOMOGENEOUS MEDIUM**

Krzyszton, D., Rogowski, L.

*Académie Polonaise des Sciences, Bulletin, Serie des Sciences Techniques*, v. 8, no. 6, pp. 269-272, 1960

The mechanics of loose media are considered as a stochastic problem. Experimental verification of the law of formation of subsidence basins in two different media was realized by discharging from narrow slit pure sand and sand interlayered with horizontal layers of mica scales. The equations of the profiles are compared with the experimental data. (*EI*, 1961)

**479. A METHOD OF STUDYING THE QUALITATIVE COMPOSITION OF ORGANIC MATTER IN SOIL SOLUTIONS**

Aleksandrova, I. V.

*Pochvovedenie*, 1960, no. 11, pp. 85-87, 1960 (in Russian with English summary)

(Translation available in *Soviet Soil Science*, 1960, no. 11, pp. 1218-1221, 1961)

The method of paper chromatography reveals the presence of low molecular organic acids, aromatic substances like the polyphenols, amino acids, and uronic acids in solutions both from lowland and from upland peat. In addition, they contain very low concentrations of purely humus substances. Judging by the composition and nature of the organic compounds present in the solutions, they may well be involved in a number of processes (decomposition of minerals, creation of organic mineral complexes, plant nutrition, stimulation of plant growth). Additional work will have to be done to develop methods of studying individual organic substances before they can be determined quantitatively. These methods may be tested for investigation of solutions from mineral soils,

water reservoirs, ground and surface water. (*BA*, v. 38, 1962, #15,770)

**480. DETERMINATION OF AMMONIA EVOLVED FROM SOIL**

Makarov, B. N.

*Pochvovedenie*, 1960, no. 8, pp. 98-99, 1960 (in Russian with English summary)

(Translation available in *Soviet Soil Science*, 1960, no. 8, pp. 882-884, 1961)

**481. IMPROVED METHOD FOR DETERMINING ADSORBED AMMONIA IN THE SOIL**

Dashevskiy, D. I.

*Pochvovedenie*, 1960, no. 8, pp. 100-105, 1960 (in Russian with English summary)

(Translation available in *Soviet Soil Science*, 1960, no. 8, pp. 885-891, 1961)

**482. CONFERENCE ON METHODS OF STUDYING HUMUS**

Kononova, M. M., Belchikova, N. P.,

Aleksandrova, I. V.

*Pochvovedenie*, 1960, no. 11, pp. 110-111, 1960

(in Russian with English summary)

(Translation available in *Soviet Soil Science*, 1960, no. 11, pp. 1243-1245, 1961)

**483. COLORIMETRIC DETERMINATION OF SOIL ORGANIC MATTER**

Perrier, E. R., Kellogg, M.

*Soil Science*, v. 90, pp. 104-106, 1960

Soil was oxidized with  $\text{Cr}_2\text{O}_7$  in  $\text{H}_2\text{SO}_4$  and this solution mixed with a solution of *sym*-diphenylcarbazide, which reacts with excess  $\text{Cr}_2\text{O}_7$ . The violet solution follows Beer's law at  $540 \text{ m}\mu$  for several minutes. Analyses of 36 soils are reported.

**484. RHEOLOGICAL SHEAR AND CONSOLIDATION BEHAVIOR OF CLAY SOILS.**

PROGRESS REPORT TO OFFICE OF NAVAL RESEARCH, DEPARTMENT OF NAVY, WASHINGTON, D.C.

Schmid, W. E., Klausner, Y., Whitemore, C. F.  
1960

Princeton University, Dept. of Civil Engineering, N. J.  
Progress Report

The following papers are included: "Introduction," W. E. Schmid, 6 pages; "Volume Rheology of Two-Phase System," Y. Klausner, 9 pages; "Mechanical Behavior of Soils," Y. Klausner, 26 pages; "Rheological Failure Theory for Clay Soils," W. E. Schmid, 62 pages; "New Instrumentation for Triaxial Test," C. F. Whitemore, 73 pages. (*EI*, 1961)

**485. BASES AND FOUNDATIONS ON FROZEN SOIL**

Tsytovich, N. A.  
1960  
National Academy of Sciences, National Research Council, Highway Research Board, Washington, D.C.  
Special Report 58

Fundamentals of foundation design for structures erected on frozen soils and special problems of foundation construction procedures and of maintenance of structures on frozen soils are discussed, as well as technical measures against harmful influences of changes which occur in soils during their freezing and thawing. Translation from Russian. 93 references. (*EI*, 1961)

**486. PRECONDITIONING AND STABILIZING SOILS BY LIME ADMIXTURES**

1960  
National Academy of Sciences, National Research Council, Highway Research Board, Washington, D.C.  
Bulletin 262

The following papers were included in the 39th annual meeting held January 11–15, 1960, in Washington, D.C.: "Lime Stabilization Using Preconditioned Soils," by W. H. Taylor, Jr., and A. Arman, pages 1–19; "Lime Fixation in Clayey Soils," by G. H. Gilt and D. T. Davidson, pages 20–32; "Lime Stabilization of Montmorillonitic Clay Soils," by D. T. Davidson, M. Mateos, and H. F. Barnes, pages 33–50; "Reaction of Hydrated Lime with Pure Clay Minerals in Soil Stabilization," by J. S. Eades and R. E. Grim, pages 51–63; "Soil-Lime Research at M.I.T.," by C. C. Ladd, Z. C. Moh, and T. W. Lambe, pages 64–85. (*EI*, 1961)

**487. CRITICAL TRACTIVE FORCES IN COHESIVE SOILS**

Smerdon, E. T., Beasley, R. P.  
*Agricultural Engineering*, v. 42, no. 1, pp. 26–29, January 1961

The stability of open channels for water conveyance systems in cohesive soils is approached on the basis of tractive force theory. A résumé of the theory is given, and the relationship between critical tractive force and physical properties of cohesive soils determined by physical and hydraulic tests is discussed. Critical tractive force values are reported for soils with void ratios of 1.23–1.84, i.e., loosely compacted soil. (*EI*, 1961)

**488. GRANULAR MOVEMENT DURING SQUEEZING**

Williams, D. C.  
*Modern Castings*, v. 39, no. 1, pp. 60–62, January 1961

An attempt is made to explain the greater density of sand adjacent to the squeeze board than at the parting line of the flask, by using material from the field of soil-mechanics. Granular movement during squeeze molding operations is divided between movement toward the horizontal and movement toward the vertical direction. Better squeeze compaction would be accomplished if the squeeze boards were decreased in size to take advantage of greater sand movement. (*EI*, 1961)

**489. ODNOMERNYE KVAZISTATICHESKIE DVIZHENIYA GRUNTA (ONE-DIMENSIONAL QUASI-STATIC MOTIONS OF SOIL)**

Grigoryan, S. S., Chernousko, F. L.  
*Prikladnaya Matematika i Mekhanika*, v. 25, no. 1, pp. 86–100, January–February 1961  
(Translation available in *PMM; Journal of Applied Mathematics and Mechanics*, v. 25, no. 1, pp. 119–137, 1961)

Motions are analyzed under slowly varying externally applied loadings for the case where it is permissible to neglect accelerations in the equations of motion. (*EI*, 1961)

**490. BIBLIOGRAPHY ON ORGANIC SOILS**

February 1961  
Commonwealth Bureau of Soil Science, Harpenden, England  
Annotated Bibliography  
(Obtainable as 241 C734A, U.S. Dept. of Agriculture Library, Washington, D.C.)

A bibliography for the period 1950–1960 is presented. The subjects of chemical properties, microbiology, and fertility are included. (*BA*, v. 36, 1961, #2007)

491. ATLANTIC DEEP-SEA SEDIMENT CORES  
Ericson, D. B.  
*Geological Society of America, Bulletin of the*,  
v. 72, pp. 193–285, February 1961

492. DIE DURCHLAESSIGKEIT DER BINDIGEN  
UND KOERNIGEN BOEDEN (PERMEABILITY OF COMPACT AND GRANULAR  
SOILS)  
Jurina, V.  
*Strasse und Autobahn*, v. 12, no. 2, pp. 51–57,  
February 1961

The factors of pore space volume, grain diameter, and travel of ground water are discussed. Equations for hygroscopic water content are given and soil types are classified in relation to permeability. Numerical values for permeability of compacted soils and critical grain diameter for various soils to obtain complete impermeability are listed. (EI, 1961)

493. NEW METHOD OF CONSOLIDATION  
COEFFICIENT EVALUATION  
Scott, R. F.  
*American Society of Civil Engineers, Proceedings  
of the*, v. 87[SM 1, paper 2746], pp. 26–39,  
February 1961

Use of logarithm of time methods based on laboratory consolidation of oedometer tests and readings of compression dial as a function of time is discussed. A new technique is presented for determination of coefficients of consolidation in soils from volume changes which take place during the consolidation process. It utilizes the ratio of compressions taking place up to different times, so that continuous compression-time readings are not required. (EI, 1961)

494. DIE BODENSTABILISIERUNG,  
INSBESONDERE MIT BITUMINOESEN  
BINDEMittelN (SOIL STABILIZATION,  
PARTICULARLY WITH BITUMINOUS  
BINDERS)  
Duebner, R.  
*Verein Deutscher Ingenieure Zeitschrift*, v. 103,  
no. 9, pp. 399–404, March 21, 1961

The state of the art is summarized, and the purpose, principles, and advantages of the process of soil stabilization are given. Types of soil required, the selection and use of the binder used, testing and maintenance of the treated soil, and the American retread process are all discussed. 20 references. (EI, 1961)

495. CALCULATION OF LABORATORY AND  
IN-SITU VALUES OF CALIFORNIA  
BEARING RATIO FROM BEARING  
CAPACITY DATA  
Black, W. P. M.  
*Géotechnique*, v. 11, no. 1, pp. 14–21, March 1961

Factors which affect results of *in-situ* and laboratory tests are reviewed. A method is presented for calculation of *in-situ* California Bearing Ratio value from knowledge of cohesion, true angle of internal friction, and suction of the soil. The results of laboratory investigations made on single size sand and on heavy clay showed close agreement between computed and measured California Bearing Ratio values. (EI, 1961)

496. SOME USES OF STRESS AND STRAIN  
INVARIANTS IN THERMODYNAMIC  
STUDY OF SOIL MOISTURE  
Coleman, J. D., Russam, K.  
*Géotechnique*, v. 11, no. 1, pp. 29–36, March 1961

The influence of osmotic pressure of salts dissolved in soil water, pressure in pore air, and a general system of nine total stresses are examined. Invariants of both stress and strain tensors can be employed in the study of soil moisture. Quantitative data are presented on the probable performance of a wide range of soil types in road sub-grade, subjected to diverse climatic conditions. (EI, 1961)

497. SYMPOSIUM ON NUCLEAR METHODS FOR  
MEASURING SOIL DENSITY AND  
MOISTURE  
March 1961  
American Society for Testing Materials,  
Philadelphia, Pa.  
Special Technical Publication 293

The following papers were presented at this symposium: "Design and Application of Nuclear Chicago d/m Gauge," by O. K. Neville and T. W. Van Zelst; "Design and Calibration of Neutron Moisture Meter," by K. N. Burn; "Application of Nuclear Soil Meters to Compaction Control for Airfield Pavement Construction," by P. F. Carlton; "Experiences With Nuclear Moisture and Density Surface Probes on O'Hare Field Project," by J. P. Gnaedinger; "Comparison of Nuclear and Sand-Cone Methods of Density and Moisture Determinations for Four New York State Soils," by S. Mintzer; and, "Evaluation of Nuclear Moisture Density Testing Equipment," by W. N. Carey, Jr., J. F. Shook and J. F. Reynolds, (EI, 1961)

498. SOIL MOISTURE MEASUREMENT

IMPROVED

Bouyoucos, G. J.

*Agricultural Engineering*, v. 42, no. 3, pp. 136-138,  
March 1961

Soil moisture is measured electrically with new, high sensitivity, nylon resin-treated plaster-of-paris blocks. The blocks are made sensitive by increasing their pore space by using high ratio of water to plaster. (*EI*, 1961)

499. LA PROVA DI PENETRAZIONE IN PROFONDITA PER L'ESAME DI TERRE DA FONDAZIONE (PENETRATION TEST AS METHOD OF INVESTIGATION OF SOILS FOR FOUNDATION ENGINEERING)

Bucchi, R.

*Tecnica Italiana*, v. 26, no. 2, pp. 93-108,  
March 1961

Delft's penetrometer as a sounding instrument is used. Data on nature, consistency, coefficient of internal friction, and compressibility are quickly obtained for economic solution of foundation works. Tests performed in the Venice region are analyzed along with laboratory results. (*EI*, 1961)

500. ABSOLUTE DATING OF DEEP-SEA CORES BY THE  $\text{Pa}^{231}/\text{Th}^{230}$  (IONIUM) METHOD

Rosholt, J. N., Emilian, C., Geiss, J., Koczy, F. F.,  
Wangersky, P. J.

*Journal of Geology*, v. 69, pp. 162-185,  
March 1961

501. TECHNIQUE FOR MEASURING THE ELASTIC PROPERTIES OF BITUMENS, TARS AND SOILS UNDER DYNAMIC LOADING

Thrower, E. N.

*Journal of Scientific Instruments*, v. 38,  
pp. 69-73, March 1961

502. ESTUDIO DE ALGUNAS ARENAS DE MOLDEO DE LA ZONA VIZCAINA-ALAVESA (STUDY OF MOLDING SANDS ORIGINATING FROM VIZCAYA AND ALAVA PROVINCES OF SPAIN)

de la Granja Alonso, M.

*Instituto del Hierro y del Acero*, v. 14, no. 74,  
pp. 342-383, April 1961

The geographical location and geologic origin of sand quarries, the granulometry, and the humidity, mechanical resistance, composition, and other characteristics of sands are discussed. Examples are given of the use of molding sands in metal foundries. 60 references. (*EI*, 1961)

503. PAST AND FUTURE OF APPLIED SOIL MECHANICS

Terzaghi, K.

*Boston Society of Civil Engineers, Journal of the*,  
v. 48, no. 2, pp. 110-139, April 1961

The author's address is presented in which he accepts first copy of book, "From Theory to Practice in Soil Mechanics," summarizing his previously published works. He reviews, at this occasion, the most important aspects of soil mechanics; he warns especially against dogmatism and misuse of soil mechanics. Many members of this profession are still spoiled by success of applied mathematics in other fields of civil engineering. (*EI*, 1961)

504. K RASCHETU STABILIZOVANNYKH OSADOK NASYPNYYKH GRUNTOV OT DEISTVIYA SOBTVENNNOGO VESA (CALCULATION OF STABILIZED SETTLING OF FILLED-IN GROUND DUE TO NATURAL WEIGHT)

Degil, B. S.

*Inzhenerno-Fizicheskii Zhurnal*, v. 4, no. 5,  
pp. 85-90, May 1961

A method is given for calculating natural settling, taking account of the effect of weight and porosity diagram. This formula can be used in the solution of engineering problems related to structures on filled-in ground. English summary. (*EI*, 1961)

505. IN-SITU MEASUREMENT OF SOIL PROPERTIES WITH PRESSUREMETER

Gibson, R. E., Anderson, W. F.

*Civil Engineering*, v. 56, no. 658, pp. 615-618,  
May 1961

A description is given of a Menard pressuremeter designed to carry out large numbers of *in-situ* load tests on soil at varying depths in borehole, and in this way arrive at an average of soil parameters that will enable engineers to forecast its behavior under load. Field tests used in calibration of instrument and evaluation of test results are discussed. (*EI*, 1961)

506. SOIL DENSITY CHECKS MADE EASY  
*Compressed Air Magazine*, v. 66, p. 25, May 1961

507. MOISTURE AND DENSITY MEASUREMENTS IN SOILS AND OTHER MATERIALS BY NUCLEAR METHOD  
Templeman, J. R.  
*Nondestructive Testing*, v. 19, no. 3, pp. 188-193, May-June 1961

A rapid nondestructive test procedure consists of exposing material containing moisture to a source of high energy neutrons. There is a well-defined linear relationship between the number of slow neutrons and moisture content of the material. (*EI*, 1961)

508. ZUR MECHANIK DES STARREN RADES AUF WEICHEM BODEN (MECHANICS OF RIGID WHEEL ON SOFT SOIL)  
Schuering, D.  
*Verein Deutscher Ingenieure Zeitschrift*, v. 103, no. 16, pp. 693-700, June 1, 1961

A review of modern methods for calculating resistance to rolling, gross traction effort, and carrying capacity of soil is presented. Model tests are compared with theory, and conclusions concerning rolling process on dry sand vs. loam are drawn. 20 references. (*EI*, 1961)

509. NEUTRON-GAMMA RAY INSTRUMENTATION FOR LUNAR SURFACE COMPOSITION ANALYSIS  
Schrader, C. D., Waggoner, J. A., Zenger, J. H., Martina, E. F., Stinner, R. J.  
June 1961  
American Rocket Society, Inc., New York, N.Y.  
61-108-1802  
(Paper presented at the National IAS/ARS Joint Meeting, Los Angeles, Calif., June 13-16, 1961)

The neutron-gamma-ray spectrometer consists of two packages: the neutron source, and the gamma-ray detector. During flight the instrument will measure the ambient gamma-ray background in space. After landing, before the accelerator is turned on, a determination of the natural and cosmic-ray-induced radioactivity of the Moon's surface will be made. Then the primary analysis of the surface composition, through detection of the gamma rays produced by the inelastically scattered neutrons, is initiated by the accelerator.

510. IMPACT WAVES IN SAND: THEORY COMPARED WITH EXPERIMENTS ON SAND COLUMNS  
Parkin, B. R.  
*American Society of Civil Engineers, Proceedings of the*, v. 87 [SM3, paper 2828], pp. 1-12, June 1961

A phenomenological theory is developed in order to study propagation of unidimensional compression waves in columns of sand. A medium of theory is treated as elastic-plastic continuum. The theory gives satisfactory agreement with experiments on stress propagation in two dry sands and with published experimental results. (*EI*, 1961)

511. ATTENUATION OF STRESS WAVES IN BI-LINEAR MATERIALS  
Skalak, R., Weidlinger, P.  
*American Society of Civil Engineers, Proceedings of the*, v. 87 [SM3, paper 2829], pp. 1-12, June 1961

One-dimensional wave equations are derived, and it is demonstrated that, beyond a given distance from the surface, intensity of peak stress and particle velocity depend only on a single parameter. The result is of significance in establishing physical characteristics of granular soils which are subjected to nuclear surface blast pressures. (*EI*, 1961)

512. GEOPHYSICS EFFICIENT IN EXPLORING SUBSURFACE  
Moore, R. W.  
*American Society of Civil Engineers, Proceedings of the*, v. 87 [SM3, paper 2838], pp. 69-100, June 1961

Data on the use of refraction seismic and electrical resistivity geophysical methods throughout the United States are given. Examples of application of these methods to a variety of subsurface problems pertinent to highway design and maintenance are presented. Studies of landslide conditions and tests made over water-covered areas are discussed. (*EI*, 1961)

513. MACHINE FOUNDATIONS AND SOIL RESONANCE  
Alpan, I.  
*Géotechnique*, v. 11, no. 2, pp. 95-113, June 1961

Methods of resonance prediction are reviewed, and a new method is presented. An evaluation of amplitude-frequency curves obtained with experimental oscillators is given. Empirical relations between resonant frequency and foundation area are shown to be consistent with analysis based on propagation of surface waves in elastic medium. 24 references. (*EI*, 1961)

**514. HEAT TRANSFER IN SOIL INVOLVING CHANGE OF STATE**

Scott, R. F.

*Géotechnique*, v. 11, no. 2, pp. 144–153, June 1961

An evaluation is presented regarding soil thermal properties and measurement technique with respect to estimation of depth of thawing or freezing in ground. The depth of thaw in permafrost was computed using a method based on heat flow into ground. Data were obtained in Alaska and Greenland. (*EI*, 1961)

**515. WATER INTAKE RATES OF CLAYPAN SOIL FROM HYDROGRAPH ANALYSES**

Jamison, V. C., Thornton, J. F.

*Journal of Geophysical Research*, v. 66, no. 6, pp. 1855–1860, June 1961

A dominant factor in determining soil moisture intake rate for the silt loam studied is moisture content. The temperature of the soil surface during a storm also influences intake rate, and perhaps soil fertility does also. Additional plant cover will increase rainfall abstraction and decrease runoff, and thereby increase apparent intake by soil. (*EI*, 1961)

**516. AUTOMATION SPURS SAMPLER DESIGN**

Mitchell, J. A.

*Rock Products*, v. 64, pp. 109–110, June 1961

**517. ORGANIC MATTER IN SOILS**

Raheja, P. C., Mann, H. S.

*Indian Journal of Agronomy*, v. 5, no. 4, pp. 292–308, June 1961

**518. PRELIMINARY DESIGN STUDY FOR A DYNAMIC SOIL TESTING LABORATORY: APPENDIX B. SMALL-SCALE FOOTING STUDIES: A REVIEW OF THE LITERATURE**

Roberts, J. E.

July 1961

Massachusetts Institute of Technology, Cambridge Report, AFSWC TR 61-48, AF 29(601)1947 AD-268,466

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A review is made of the literature on small-scale testing of footings on soil, particularly of efforts to determine the static ultimate bearing capacity. Literature published before 1960 is discussed, while later reports are only listed in the bibliography. The review was performed as a part of a preliminary design study for a dynamic soil testing laboratory, and was intended to determine why some past efforts were worthwhile and others essentially worthless. It is concluded that the best success is achieved in non-quantitative verification of the modes of deformation and patterns of behavior, particularly of the size, shape, and presence of rupture zones. Good results are obtained from attempts to supplement established theories with empirical correction factors, but attempts to verify quantitative relationships or to establish numerical values have generally failed. 47 references. (ASTIA)

**519. CONSTANT SHEAR LINES FOR UNCONFINED COMPRESSION TEST APPARATUS**

Mohan, D.

*Civil Engineering*, v. 56, no. 660, pp. 921–922, July 1961

A procedure for drawing lines of constant shear for an unconfined compression test is described. These lines are usually drawn on transparent mask which, when superimposed upon rupture curve, directly reads out shear strength of soil. (*EI*, 1961)

**520. REFLEXIONS SUR LA POROSITÉ ET LA LIMITÉ INFÉRIEURE DE LA LOI DE DARCY (SOME THOUGHTS ON POROSITY AND LOWER LIMIT IN DARCY'S LAW)**

Muller-Feuga, R., Ruby, P.

*Houille Blanche*, v. 16, no. A, pp. 383–387, July 1961

Some reasons for accepting a lower limit for Darcy's law are given, and indications for the existence of "initial gradient" before actual flow movement begins are presented. Porosity is considered as an intrinsic characteristic of given terrain. Flow capacity, retentive capacity, and "coefficient of porosity"  $m$ , in the case when water occupying voids in saturated soil is allowed to drain off, are considered. (*EI*, 1961)

521. SAMPLING OF SAND

*Modern Castings*, v. 40, no. 1, pp. 49–54, July 1961

A report is given of a survey of sampling techniques and an investigation of probable error to be expected in sieve tests undertaken by committees of the American Foundrymen's Society and of the National Industrial Sand Association. It was found that there is no universal simple method of sand sampling. Other conclusions and recommendations are also presented. (*EI*, 1961)

522. AXIALLY SYMMETRIC PLASTIC DEFORMATIONS IN SOILS

Cox, A. D., Eason, G., Hopkins, H. G.  
*Royal Society of London, Philosophical*

*Transactions of the Series A—Mathematical and Physical Sciences*, v. 254, no. 1036, pp. 1–45,

August 24, 1961

A theoretical investigation is given of quasi-static axially symmetric plastic deformations in soils. The mechanical behavior is approximated by that of ideal soil which obeys Coulomb's yield criterion and associated flow rule, with restriction to rigid, perfectly plastic deformations. Applications of the theoretical analysis relate to problems of mechanical testing of soil samples and of load-bearing capacity in foundation engineering. 37 references. (*EI*, 1961)

523. 5TH INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND FOUNDATION ENGINEERING, PARIS

*Engineering News*, v. 167, p. 23, August 24, 1961

524. COMPARISON OF ANALYTICAL METHODS USED IN GEOCHEMICAL PROSPECTING FOR COPPER

Huff, L. C., Lovering, T. G., Lakin, H. W.,  
Myers, A. T.  
*Economic Geology and the Bulletin of the Society of Economic Geologists*, v. 56, pp. 855–873,  
August 1961

Soil sampling is discussed.

525. LUNAR IMPACT PROBE

Palmore, J. I., III  
*ARS Journal*, v. 31, no. 8, pp. 1066–1073,  
August 1961

Lunar impact probes are discussed as a means of obtaining information concerning the surface of the Moon. The

impact problems are investigated by analyzing the origin of forces resisting penetration.

526. IDENTIFICATION AND CHARACTERIZATION OF ORGANIC NITROGEN, ORGANIC PHOSPHORUS, AND FLUORESCENT COMPOUNDS IN ELECTROPHORETIC SEPARATES OF SOIL ORGANIC MATTER

Waldron, A. C. (Ohio State University, Columbus, 1958, Thesis)

*Dissertation Abstracts*, v. 22, no. 2, p. 432,  
August 1961

(Obtainable as 241.8 M58, U.S. Dept. of Agriculture Library, Washington, D.C.; microfilm available as Mic 61-2853, University Microfilms, Ann Arbor, Mich.)

527. SOIL ANALYSIS AND VOLUME WEIGHT OF SOIL

Sandved, G.

*Gartneryrket*, v. 51, no. 35,  
pp. 885–886, September 1, 1961

(Obtainable as 80G1938, U.S. Dept. of Agriculture Library, Washington, D.C.)

528. THERMOGRAVIMETRY OF THE ORGANIC MATTER OF A PODZOL SOIL

Schnitzer, M., Hoffman, I.

*Chemistry and Industry*, v. 35, pp. 1397–1398,  
September 2, 1961

529. PREDICTING EQUIPMENT PERFORMANCE IN SOILS FROM SCALE MODEL TESTS

Nuttall, C. J., Jr., McGowan, R. P.  
Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 408A, presented at SAE National Meeting, Milwaukee, Wis., September 11–14, 1961

The U.S. Army Transportation Research Command (USATRECOM) program to develop vehicle-mobility scale-model understanding for all types of soft terrain is discussed. Geometric scale models of vehicles are used and tests planned so that direct comparisons of model and full-size performance can be made. Also mentioned are a method for characterizing soils and snows, how correlation is achieved, tabulation of test-tire characteristics, and future plans to extend studies into marsh and muskeg, clays, loams, and muds. (*EI*, 1961)

530. SOIL BINS AND INSTRUMENTATION FOR RESEARCH AND ENGINEERING APPLICATIONS

Harrison, W. L., Jr.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 408B, presented at SAE National Meeting,  
Milwaukee, Wis., September 11-14, 1961

The introduction of soil bins for testing concepts of full and reduced scale vehicles, components, and mechanical devices whose operation is influenced by soil characteristics is discussed. Reference is made to the M. G. Bekker soil value system measuring stress-strain characteristics of soils under vertical and horizontal loading. The development of a wheeled Bevameter to measure soil values is mentioned, and types of soils, soil processing equipment, soil bins, and test equipment used at the Land Locomotion Laboratory are discussed. (EI, 1961)

531. TECHNIQUE FOR OBSERVING STRUCTURE-SOIL INTERACTION

Selig, E. T.

*Materials Research and Standards*, v. 1, no. 9,  
pp. 717-719, September 1961

Direct visual observation of the interaction of the soil with various structural members such as foundations, tunnels, buried shelters, and retaining walls is often very valuable. A method for two-dimensional observation uses a soil container with removable plate glass sides. The frame is of aluminum. A grid of lines is used on the surface of the soil adjacent to the glass. (EI, 1961)

532. GEOCHEMICAL VARIATIONS IN FOUR RESIDUAL SOILS

Short, N. M.

*Journal of Applied Physics*, v. 32, no. 9,  
September 1961

533. THERMAL CONDUCTIVITY OF POROUS MEDIA—1, 2: UNCONSOLIDATED SANDS

Woodside, W., Messmer, J. H.

*Journal of Applied Physics*, v. 32, no. 9,  
pp. 1688-1706, September 1961

A method of conductivity measurement using transient line heat source (thermal conductivity probe) is suggested. Data are reported showing the variation of effective thermal conductivity with porosity, solid particle conductivity, saturating fluid conductivity, and the pressure of the saturating gas. Consolidated rocks are discussed. Data for six sandstones ranging in porosity from 3 to 59% are presented, and the results are compared with

those obtained for unconsolidated sands. 45 references. (EI, 1961)

534. LA MESURE "IN SITU" DE LA VALEUR APPROCHÉE DU COEFFICIENT DE PERMÉABILITÉ DES TERRAINS ALLUVIAIRES (IN SITU MEASUREMENT OF APPROXIMATIVE VALUE OF PERMEABILITY COEFFICIENT OF ALLUVIAL SOILS)

Vibert, A.

*Génie Civil*, Le, v. 138, no. 19, pp. 407-410,  
October 1, 1961

The use of the well-known formula of Dupuit is discussed. The K factor of this formula gives only medium values. Supplementary formulas are derived and a better definition of K value is given. (EI, 1961)

535. ICE-GRAIN STRUCTURE AND CRYSTAL ORIENTATION IN ICE LENS FROM LEDA CLAY

Penner, E.

*Geological Society of America, Bulletin of the*,  
v. 72, no. 10, pp. 1575-1577, October 1961

The long axes of ice grains were oriented parallel to the direction of heat flow. A random c-axis orientation, determined by etching technique, appeared to exist. In some adjacent crystals, c-axes were as much as 45 deg apart; this disorder seems to be consistent with disorderly distribution of clay particles in ice lens. (EI, 1961)

536. NEW TEST FOR ESTIMATING SOIL CORROSION BASED ON INVESTIGATION OF METAL HIGHWAY CULVERTS

Stratfull, R. F.

*Corrosion*, v. 17, no. 10, pp. 115-118, October 1961

Corrosion rates of several thousand metal highway culverts buried in California soils were studied with respect to soil resistivity and pH. A new test method was derived to estimate soil corrosivity, and statistical analysis was used to compare its accuracy with other known methods. It was found that within limits this new method was a more reliable indicator of relative soil corrosivity than any of the other methods investigated. (EI, 1961)

537. REFRACTION AND REFLECTION OF SONIC ENERGY IN VELOCITY LOGGING

Tuman, V. S.

*Geophysics*, v. 26, pp. 588-600, October 1961;  
(discussion by J. Geertsma), v. 27, pp. 275-276,  
April 1962

538. CALCIMETER FOR ROUTINE USE ON SOIL SAMPLES  
Bascomb, C. L.  
*Chemistry and Industry*, pp. 1826–1827,  
November 11, 1961
539. CARBONATE AND OXYGEN ISOTOPIC ANALYSIS OF CORE 211A  
Emillant, C., Mayeda, T.  
*The Journal of Geology*, v. 69, pp. 729–732,  
November 1961
540. SAMPLING DEVICES USED IN THE ANAEROBIC CONTACT PROCESS  
Fall, E. B., Jr., Kraus, L. S.  
*Water Pollution Control Federation, Journal of the*, v. 33, pp. 1212–1214, November 1961
541. DETERMINATION OF CARBON IN ORGANIC SOILS BY OXYGEN FLASK COMBUSTION  
Gutenmann, W. H., Lisk, D. J.  
*Journal of Agricultural and Food Chemistry*, v. 9, pp. 489–490, November 1961
542. COMPOSITIONAL LOGGING OF AIR-DRILLED WELLS  
Hooper, W. F., Earley, J. W.  
*American Association of Petroleum Geologists, Bulletin of the*, v. 45, pp. 1870–1883,  
November 1961
543. NEW METHOD GIVES COMPONENTS IN SOIL'S ORGANIC MATTER  
Felbeck, G. T., Jr.  
*Chemical and Engineering News*, v. 39, pp. 49–50,  
December 11, 1961
544. ANNOTATED BIBLIOGRAPHY OF LUNAR PROPERTIES, GEOLOGY, VEHICLES, AND BASES, PART I: KNOWN AND CONJECTURED PROPERTIES  
Beltran, A. A., Goldmann, J. B., Graziano, E. E.,  
Compilers  
December 1961  
Lockheed Aircraft Corp., Missiles and Space Division, Sunnyvale, Calif.  
SB-61-67, Part I  
AD-271,941

This lunar bibliography is divided into three parts, each of which is being issued separately. Part I deals with the physical properties, geology, volcanism, selenomorphology, mineralogy and maps of the Moon.

545. DETECTING OUTLIERS IN SOIL-ADDITIVE STRENGTH TESTS  
David, H. T., Davidson, D. T., O'Flaherty, C. A.  
*Materials Research and Standards*, v. 1,  
pp. 947–950, December 1961
546. LARGE-SCALE LABORATORY INVESTIGATION OF SAND CONSOLIDATION TECHNIQUES  
Hower, W. F., Brown, W.  
*Journal of Petroleum Technology*, v. 13  
(Transactions), pp. 1221–1229, December 1961
547. EARTH RESISTIVITY MEASUREMENTS FOR GROUNDING GRIDS  
Kinyon, A. L.  
*Power Apparatus and Systems*, pp. 795–800,  
December 1961
548. MULTIPLE SOIL SAMPLER  
Parsons, P. J.  
*American Society of Civil Engineers, Proceedings of the*, v. 87 [SM6, paper 3012], pp. 19–28,  
December 1961
549. PRINCIPLES GOVERNING THE PROFESSIONAL PRACTICE OF SOIL MECHANICS AND FOUNDATION ENGINEERING  
*Civil Engineering*, v. 31, p. 72, December 1961
550. ON NEW APPROACH TO ANALYSIS OF LIMIT STATES IN SOILS AND IN OTHER CONTINUOUS MEDIA  
Sobotka, Z.  
*Académie Polonaise des Sciences, Bulletin de la, Serie des Sciences Techniques*, v. 9, no. 2,  
pp. 85–93, 1961

A new method enables simplification of solutions in the general case of nonhomogeneous soils and other continuous media, for which a plasticity condition is represented by Mohr's envelope in the general form of a continuous curve. Equations derived of limiting equilibrium are quasi-linear systems of the hyperbolic type which may easily be integrated by the method of characteristics using finite differences. (*EI*, 1961)

551. STRESS DISTRIBUTION IN TRIAXIAL COMPRESSION TEST

Sinha, S. B., Verma, P. D. S., Sen, B. R.  
*Académie Polonaise des Sciences, Bulletin de la, Serie des Sciences Techniques*, v. 9, no. 3, pp. 169–173, 1961

The determination of shearing strength of soils is discussed along with the problem to find stresses and displacements at any point inside the test material and to determine conditions of failure. The first attempt was made by A. Balla who assumed the test material to obey Hooke's law. The same problem has been considered using Seth's law, and an exact solution is obtained. (EI, 1961)

552. PROPAGATION OF SPHERICAL WAVES IN NON-HOMOGENEOUS ELASTIC-VISCO-PLASTIC MEDIUM

Olszak, W., Perzyna, P.  
*Académie Polonaise des Sciences, Bulletin de la, Serie des Sciences Techniques*, v. 9, no. 9, pp. 509–516, 1961

The generalization of propagation of stress wave in a homogeneous body to a nonhomogeneous medium for application to problems of geophysics and soil dynamics is discussed. An appropriate choice of variable parameters on the basis of experimental results allows a description of the behavior of the body under intense dynamic loads in the form of high pressure. The model considered is proposed by A. M. Freudenthal, but modified to take nonhomogeneity into account. (EI, 1961)

553. RAPID METHODS FOR THE DETERMINATION OF HUMUS COMPOSITION IN MINERAL SOILS

Kononova, M. M., Belchikova, N. P.  
*Pochvovedenie*, 1961, no. 10, pp. 75–87, 1961 (in Russian with English summary)

554. TWENTY-FIVE YEARS OF SOIL MICROBIOLOGY AND A LOOK TO THE FUTURE

Allison, F. E.  
*Soil Science Society of America, Proceedings of the*, v. 25, no. 6, pp. 432–439, 1961

A review of progress made in soil microbiology and trends of research during the past 25 years is given. The subject is discussed under the following headings: soil population, organic matter, nutrient availability, symbiotic N fixation, nonsymbiotic N fixation, losses of N from soils, soil aggregation, antibiotics, soil pesticides, rhizosphere, and biological control of plant diseases. It is

shown that remarkable progress has been made in most of these subjects. In recent years the nature of most researches has tended to be more and more quantitative and biochemical in nature as fundamental knowledge has increased, and instrumentation has improved. The fortunate result is that soil microbiology is now closely linked with general soil science, general microbiology and the plant sciences. Since there are few phases of soil science where microorganisms do not play a major role, microbiologists must work closely with other soil scientists if the efforts of all are to yield maximum returns. (BA, v. 38, 1962, #12,449)

555. OKRESLANIE WILGOTNOSCI I CIEZARU OBJETOSCIOWEGO GRUNTOW SYPKICH IN SITU METODAMI RADIOMETRYCZNYMI (IN SITU DETERMINATION OF HUMIDITY AND VOLUME WEIGHT OF NONCOHESIVE SOILS BY MEANS OF RADIOMETRIC METHODS)

Borowczyk, M., Czubek, J., Dziunikowski, B., Jurkiewicz, L., Krzuk, J., Niewodniczanski, J., Rossinski, B., Zuber, A.  
*Archiwum Inżynierii Ładowej*, v. 7, no. 2, pp. 193–218, 1961

An isotopic device measures volume weight of soil on the basis of the dissipation properties of gamma-rays. Another apparatus is described for the measurement of soil humidity based on dissipation properties of neutrons; its results are presented. (EI, 1961)

556. SOIL ORGANIC MATTER

1961  
British Columbia Department of Agriculture,  
Field Crops Branch, Victoria, B. C.  
Soils Series 3  
(Obtainable as 56.9 B772, U.S. Dept. of  
Agriculture Library, Washington, D.C.)

557. METHODS OF ANALYSIS FOR SOILS, PLANTS, AND WATERS

Chapman, H. D., Pratt, P. F.  
California, University of, Division of Agricultural Sciences, Berkeley, 1961  
(Obtainable as 395 C363, U.S. Dept. of Agriculture Library, Washington, D.C.)

Two of the chapters of special interest are: Chapter 34, "Spectrographic Techniques," by A. P. Vanselow and G. R. Bradford; and Chapter 25, "Application of X-ray Fluorescence Spectrometry in Plant and Soil Analysis," by L. D. Whittig. (BA, v. 36, 1961, #2076)

558. O VOZMOZHNom OBOBShCHENII TEORII PROCHNOSTI MORA I GUBERA-MIZESAGENKI (POSSIBLE UNIFICATION OF STRENGTH THEORIES OF MOHR AND OF HUBER-MISES-HENCKY)  
Filonenko-Borodich, M. M.  
*Inzhenernyi Sbornik*, v. 31, pp. 15-23, 1961

An application of Mohr circles to rocks is completed with a graphical representation of the limit of elasticity. (EI, 1961)

559. THEORY OF CONSOLIDATION FOR SOILS EXHIBITING SECONDARY COMPRESSION  
Gibson, R. E., Lo, K. Y.

*Acta Polytechnica Scandinavica*, no. 296, 1961  
(Civil Engineering and Building Construction Series, No. 10)

General expressions for excess pore water pressure and settlement for any type of monotonic time-dependent loading have been obtained and are specialized to the case of step loading. The factors considered are permeability, viscosity, and primary and secondary compressibility of soil structure. The results of laboratory tests on London clay, Grangemouth clay, and sodium bentonite are presented. (EI, 1961)

560. THEORIE DREIDIMENSIONALER SET-ZUNGSVORGÄNGE IN TONSCHICHTEN (THEORY OF 3-DIMENSIONAL SUBSIDENCE PROCESSES IN LAYERS OF CLAY)  
Heinrich, G., Desoyer, K.  
*Ingénieur-Archiv.*, v. 30, no. 4, pp. 225-253, 1961

The derivation of fundamental equations with their solution is presented for the problem of determining the effect produced by disturbing the state of soil-moisture equilibrium on ground water flow and soil movement. Samples of application and a critique of M. A. Biot's approach to the problem are given. (EI, 1961)

561. SOBRE LA DETERMINACION DE MATERIA ORGANICA EN SUELOS (DETERMINATION OF ORGANIC MATTER IN SOILS)  
Lachica Garrido, L. M., Montesinos Gallego, R.  
*Anales Edafologia y Agrobiologiya*, v. 20, no. 4, pp. 167-175, 1961

A method is proposed for the determination of organic matter in soils using potassium dichromate. A correlation between Cr<sup>+++</sup> resulting from the reduction of the dichromate and the organic matter content expressed in

% C was found. (English summary) (BA, v. 38, 1962, #15,815)

562. CONTINUOUS FLOW METHOD IN SOIL MICROBIOLOGY. I. APPARATUS  
Macura, J.  
*Folia Microbiology*, v. 6, no. 5, pp. 328-334, 1961

A continuous flow method is described as applied to the investigation of microbiological processes taking place in soil samples. The principle of the method and its technical arrangement are also presented in detail. The applicability of the continuous flow method to microbiological research is discussed. (BA, v. 37, 1962, #18,875)

563. LAW OF SOLUBILIZATION AND SOIL ANALYSIS  
Saidel, T., Pavlovsky, G.  
*Za Sotsyalisticheskoe Selskokhoz Naukovi*, v. 10, no. 3, pp. 269-284, 1961

564. AXIALLY SYMMETRICAL AND THREE-DIMENSIONAL LIMITING STATES OF NON-HOMOGENEOUS SOILS AND OTHER CONTINUOUS MEDIA  
Sobotka, Z.  
*Archiwum Mechaniki Stosowanej*, v. 13, no. 2, pp. 151-175, 1961

Basic principles of axially symmetric three-dimensional theory and limiting state conditions of nonhomogeneous media are presented. Quasi-linear partial derivative differential equations for various curvatures are established. The solution of the equations is obtained. (EI, 1961)

565. STANDARD PISTON SAMPLING  
*Sweden Geotechnical Institute, Proceedings of the*, no. 19, 1961

The standard comprises a composite piston sampler type with a 50-mm-D cutting edge, 700-mm punching stroke and 0.4% inside clearance. The sampling tubes are plastic. The sampler prototype was tested in the field with regard to sample quality, ruggedness, and handling. (EI, 1961)

566. SOIL SCIENCE AND GEOGRAPHY  
Gorshenin, K. P.  
*Pochvovedenie*, 1961, no. 2, pp. 114-116, 1961 (in Russian with English summary)  
(Translation available in *Soviet Soil Science*, 1961, no. 2, pp. 220-222, 1962)

567. NATURAL EARTH CURRENTS AND ELECTRIC LOGGING  
Garland, G. D.  
*Canadian Mining and Metallurgical Bulletin*, v. 55, pp. 43–45, January 1962.
568. STRUCTURE OF SOIL HUMIC ACID. II. SOME COPPER OXIDE OXIDATION PRODUCTS  
Greene, G., Steelink, C.  
*The Journal of Organic Chemistry*, v. 27, no. 1, pp. 170–174, January 1962
569. STOMPER REPLACES DYNAMITE IN GEOPHYSICAL EXPLORATION  
*Gas Age*, v. 129, pp. 12–13, February 15, 1962
570. SIMPLE FIELD TEST HELPS TO PREVENT CAVE-INS  
Borden, C. W.  
*Roads and Streets*, v. 105, pp. 56–57, February 1962
571. THEORY OF A PNEUMATIC DILUTION CALORIMETRIC PROBE  
Edmonson, R. B., Thompson, W. R., Hines, A. L.  
*ARS Journal*, v. 32, pp. 257–258, February 1962
572. ENGINEERING USE OF GEOLOGY AND GEOPHYSICS  
Skehan, J. W.  
*Water Pollution Control Federation, Journal of the*, v. 34, pp. 195–199, February 1962  
Soil resistivity is considered.
573. CONFERENCE ON EXPLORATION GEOPHYSICS, TODAY AND TOMORROW [TEXT OF PAPERS]  
*Geophysics*, v. 27, pp. 109–161, February 1962
574. APPLICATION OF GAS CHROMATOGRAPHY TO THE ANALYSES OF ORGANICS, WATER, AND ADSORBED GASES IN THE LUNAR CRUST  
Oyama, V. I., Vango, S. P., Wilson, E. M.  
*ARS Journal*, v. 32, pp. 354–360, March 1962

575. A LUNAR SURFACE MODEL FOR ENGINEERING PURPOSES  
Head, V. P.  
American Rocket Society, Inc., New York, N.Y.  
Paper 2475-62, presented at the ARS Lunar Missions Meeting, Cleveland, Ohio, July 17–19, 1962

Sub-resolution surface geometry and soil strength of the lunar maria are deduced using evidence from several disciplines. Contiguous and overlapping craterlets in sintered granular rock of strength proportional to depth are predicted for the least formidable areas, and demonstrated by table-top models of the lunar surface and by statistical and thermo-mechanical studies. Scale factors required for dynamic model testing of a lunar surface mechanism at Earth gravity are derived and tabulated, with consideration for the interaction between model mechanism and environmental model terrain. Vigorous pursuit of engineering interpretations of thermal, photometric, radar-echo, and radar-penetration evidence is shown to be well worthwhile, and close-up visual observation and soil penetration experiments are urged as vital precursors to the manned lunar mission.

576. MEASURING LUNAR PROPERTIES FROM A SOFT-LANDER  
Eimer, M.  
*Astronautics*, v. 7, no. 7, pp. 30–33, July 1962  
(Available as TR 32-282, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.)

A variety of instruments is described which will analyze the Moon's texture, body structure, petrology, and other physical and chemical characteristics, as well as the nature of any "atmosphere" and fields.

577. SOME CALCULATIONS BEARING ON THE USE OF NEUTRON ACTIVATION FOR REMOTE COMPOSITIONAL ANALYSIS  
Metzger, A. E.  
August 5, 1962  
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif.  
TR 32-286

The ability of an instrument utilizing fast (14 Mev) neutrons to perform compositional analysis of a lunar or

planetary surface from a soft-landing spacecraft vehicle has been examined. The properties and interface characteristics of this instrument have been defined as realistically as possible. Sensitivities of detection have been calculated for many elements, taking into account the effects of competing reactions. The results show that such an instrument would be a sensitive analytic tool for measuring the abundance of a variety of geologically important elements.

578. "GULLIVER"—A QUEST FOR LIFE ON MARS

Levin, G. V., Heim, A. H., Clendenning, J. R.,  
Thompson, M. F.

*Science*, v. 138, no. 3537, pp. 114–121,  
October 12, 1962

Soil is sampled by the adherence of the sample to a string drawn over a sand and gravel surface. The string is placed in nutrient broth containing sodium formate-C<sup>14</sup>. Evolution of C<sup>14</sup>O<sub>2</sub> shows the presence of organisms.

**VEGETATION—SAMPLING, HARVESTING, PRODUCING, AND HANDLING**

579. MECHANICAL POTATO HARVESTER  
*Engineering*, v. 178, p. 248, August 20, 1954

580. MECHANIZED CULTIVATION AND HARVESTING OF SUGAR BEET  
*The Engineer*, v. 198, pp. 638–639, November 5, 1954

581. SELECTIVE SCATTERING OF LIGHT BY PIGMENT-CONTAINING PLANT CELLS  
Latimer, P., Rabinowitch, E.  
*The Journal of Chemical Physics*, v. 24, no. 2, p. 480, February 1956

Light scattered through 90 deg by a suspension of green alga chlorella cells shows absorption maxima at wavelengths about  $25\text{ m}\mu$  shorter than those characteristic of the pigments (chlorophyll and carotenoids). (PA, 1956)

582. MECHANICAL HARVESTING OF SUGAR BEET  
*The Engineer*, v. 202, p. 596, October 26, 1956

583. FARMING ON THE MOON  
Douglas, J. W. E. H. S.  
*British Interplanetary Society, Journal of the*, v. 15, pp. 17–28, 1956

The possibility of utilizing soilless cultures to produce crops under lunar conditions is considered.

584. HARVESTING MACHINERY FOR BROWN SUB-LITTORAL SEAWEEDS  
Jackson, P.  
*The Engineer*, v. 203, pp. 400–402, 439–441, March 15–22, 1957

585. NEW BRUSH CUTTER SIMPLIFIES ROADSIDE MAINTENANCE  
Granger, J. F.  
*Public Works*, v. 88, p. 140, June 1957

586. FORAGE HARVESTING MACHINE  
*The Engineer*, v. 205, p. 552, April 11, 1958

587. FORAGE HARVESTING IMPROVED; LUNDELL FORAGE HARVESTER  
*Engineering*, v. 185, p. 518, April 25, 1958

588. AUTOMATIC HYDRAULIC LEVELING SYSTEM PERMITS MACHINE OPERATION ON SLOPES  
*Machine Design*, v. 30, p. 124, May 15, 1958

589. PLANTS AS GUIDE TO MINERALIZATION  
Carlisle, D., Cleveland, G. B.  
1958  
California Department of Natural Resources, Division of Mines, San Francisco  
Special Report 50  
(See also excerpt in *Mining Journal*, v. 252, no. 6460, p. 649, June 12, 1959)

A method of detecting a blind ore deposit by abnormal concentration of metals in plants, or by the distribution of plants that will or will not tolerate certain metals more readily than others is presented. Absorption of metals by plants and the biogeochemistry of molybdenum are discussed. (EI, 1959)

590. DEVELOPMENT OF FRUIT AND NUT HARVESTER  
Fridley, R. B., Adrian, P. E.  
*Agricultural Engineering*, v. 40, no. 7, pp. 386–387, 391, July 1959

A report is made on a cooperative research project between the University of California and the U.S. Department of Agriculture to develop new pickup principle that would pick fruit off ground without damage or disturbing soil surface. The principle consists of a small reel (or roll) that rotates against direction of travel, and a second reel, above and in front of the first reel, that rotates in the opposite direction. The second reel is flexible to prevent damaging fruit as it passes between reels. This device has now been accepted for manufacture. (EI, 1959)

591. GARDENS FOR SPACE  
*Boeing Magazine*, v. 29, no. 7, pp. 6–7, July 1959

Plants and animals that could be raised in space to supplement the diet for astronauts are discussed.

592. HARVESTER TILTS TO STAY ON THE LEVEL

*Product Engineering*, v. 30, p. 72, October 12, 1959

593. EXPERIMENTS IN HARVESTING DWARF CORN

Pickard, G. E., Bateman, H. P.

*Agricultural Engineering*, v. 40, no. 12, pp. 732-735, 745, December 1959

Experiments to determine machinery problems arising with the use of present equipment and to explore adapting regular small-grain combine header to dwarf corn harvesting are discussed. The cutoff harvesting system is effective. Ear losses are excessive in ridged cultivated corn. A dwarf corn with more uniform ear height is needed to make picking easier. (*EI*, 1960)

594. AERODYNAMICS OF HARVESTING

*Engineering*, v. 190, p. 293, August 26, 1960

Notes on the forage harvester developed on aerodynamic principles by a division of Glester Aircraft, which is a departure from the conventional type, are presented. Four complete rows of blades act as a fan and produce a strong enough air flow to whisk the crop up the chute without relying on a mechanical impact. A blade with an inclined cutting edge slices through the crop with minimum effort. Existing facilities for work on aircraft are being used. (*EI*, 1960)

595. HYDROPONICS WILL FEED MEN ON THE MOON

Thompson, G. V. E.

*Engineering*, v. 190, p. 294, August 26, 1960

A solution to the problem of growing food in a lunar or planetary environment is offered by the use of hydroponics.

596. DEVELOPMENT OF MECHANICAL TOMATO HARVESTER

Stout, B. A., Ries, S. K.

*Agricultural Engineering*, v. 41, no. 10, pp. 682-685, October 1960

The harvester, based on the "once-over" harvesting principle, cuts off the plant below the soil surface. Fruit is shaken onto an inclined rubber belt and rolled down a slope into a conveyer. Variety thus harvested must have high ratio of ripe to green fruit at harvest time. Machine was tested on ten varieties at Michigan State University and on two varieties in commercial fields. (*EI*, 1960)

597. ARITHMETIC DETERMINATION OF REQUIREMENTS—TRANSPORT FOR COMPLETE CANE HARVESTER

Boyce, D. S.

*Sugar y Azucar*, v. 55, no. 12, pp. 42-43, December 1960

A method of determining transport requirements (transport and power units) for continuous operation of a single cutter-loader-type sugar cane harvester is discussed. Two basic approaches consider using the same transport both in the field and on the road, and secondly that transport be broken down into sub-units for use in the field and then reassembled for the journey to the mill. (*EI*, 1961)

598. SEED CLEANING BY ELECTROSTATIC SEPARATION

Harmond, J. E., Brandenburg, N. R., Booster, D. E.

*Agricultural Engineering*, v. 42, no. 1, pp. 22-25, January 1961

Field crop seed mixtures containing contaminants, such as weed seed, chaff, or other crop seed, separated by conductivity differences are considered. An experimental machine developed by the Oregon Agricultural Experiment Station and the U.S. Department of Agriculture consists essentially of a feed hopper, a positively charged conveyor belt, 25,000-v dc power unit, adjustable dividers, and a negative beam-type electrode consisting of 0.75-in.-D tungsten wire in parallel contact. (*EI*, 1961)

599. FIELD MECHANIZATION NEWS HEADLINES IN 1960

*Sugar y Azucar*, v. 56, no. 1, pp. 6, 8-9, January 1961

Notes on equipment for use in conjunction with sugar cane growing and harvesting are presented. Information is given on various harvesters, use of a semitrailer for handling and transporting cane, high flotation tires to reduce field compaction, high clearance machine for field spraying or dusting, cane cutting machine, etc. (*EI*, 1961)

600. OFFSET HARVESTER

*The Engineer*, v. 211, p. 526, March 31, 1961

601. PULPING SOUTHERN PINE INCREMENT CORES BY MEANS OF A SMALL SCALE KRAFT PROCEDURE

van Buijtenen, J. P., Joranson, P. N.,

MacLaurin, D. J.

*Tappi*, v. 44, pp. 166-169, March 1961

602. BIOLOGICAL BASES FOR SAMPLING  
IN STUDIES OF WOOD PROPERTIES  
Richardson, S. D.  
*Tappi*, v. 44, pp. 170–173, March 1961

603. MODERN FARM IMPLEMENTS  
*Lubrication*, v. 47, no. 3, pp. 29–40, March 1961

Discussion includes only representative machines which the modern farmer might use to raise several of the common crops such as rotary chopper, moldboard plow, disk harrow, grain drill, cultivator, forage harvester, corn picker, combine, mower and hay crusher, self-propelled windrower, side delivery rake, cotton picker, etc. Lubricants, lubrication, and equipment storage are discussed. (*EI*, 1961)

604. MASZYNY, NARZEDZIA I CIAGNIKI  
ROLNICZE (AGRICULTURAL MACHINES,  
IMPLEMENTS AND TRACTORS)  
Lewicki, R.  
*Przeglad Mechaniczny*, v. 20, no. 11–12,  
pp. 347–350, June 1961

Tractor plows and cultivators, disk harrows, machines for soil fertilizing, sowing machines and implements for row crop cultivation, tractor-trailer sprayer, combine harvester, grain cleaning machines, and potato diggers are discussed. (*EI*, 1961)

605. THREE-POINT HITCH MOUNTED PICKER  
Dankel, D. D.  
Society of Automotive Engineers, Inc.,  
New York, N.Y.  
Paper 393A, presented at SAE National Meeting,  
Milwaukee, Wis., September 11–14, 1961

Design objectives and development of a two-row corn picker and picker sheller by Motec Industries, Inc., are presented. This implement can be mounted by one man in less than 1 min, and lifting is accomplished by the power unit of a tractor. Operational features and performance are discussed. Novel features are incorporated which afford positive gathering and delivering of corn stalks and prevent loss of ear corn sliding down rolls and out to the ground. (*EI*, 1961)

606. NEW COMBINE HARVESTERS  
*The Engineer*, v. 212, pp. 572–573, October 6, 1961

607. MECHANICAL HARVESTER INCREASES  
TOMATO YIELD  
*Food Engineering*, v. 34, p. 91, January 1962

608. NATIONAL POWER FARMING CON-  
FERENCE, HARROGATE  
*The Engineer*, v. 213, p. 317, February 16, 1962

609. RECENT RESEARCH ON THE EXPLOSIVE-  
NESS OF AGRICULTURAL PRODUCTS  
Jacobson, M., Nagy, J.  
*Food Technology*, v. 16, pp. 32–34, February 1962

## DUST AND PARTICLES—SAMPLING, TESTING, AND CONTROL

### 610. BUREAU OF MINES MIDGET IMPINGER

Schrenk, H. H., Feicht, F. L.

1939

U.S. Department of Interior, Bureau of Mines,  
Washington, D.C.

IC 7076

A light, compact, self-contained, hand-operated midget impinger dust-sampling apparatus developed by the Bureau of Mines is described. Results are given of laboratory tests with silica dust, lead dust, and lead fume, and of field tests on Catoctin green-stone and siliceous schist. The efficiency of the midget impinger is compared with that of the large impinger.

### 611. SIZE OF SMALLEST PARTICLES DETERMINED IN IMPINGER DUST-COUNTING METHODS

Brown, C. E., Fisher, M., Boyer, F. F.

1951

U.S. Department of Interior, Bureau of Mines,  
Washington, D.C.

RI 4802

Tests conducted by the Bureau of Mines show that smaller particles of silica dust and bituminous-coal dust can be detected by a dark-field counting method better than by a light-field one. Dust-counting methods and related principles of microscopy are discussed, and techniques are described for sampling with the impinger apparatus and for counting dust particles in the resulting samples.

### 612. THE DEVELOPMENT OF GASOLINE-ENGINE-DRIVEN AND ELECTRIC-MOTOR-DRIVEN COLLECTIVE PROTECTORS FOR FIXED INSTALLATIONS

Jessop, S. M.

October 13, 1953

Chemical and Radiological Laboratories,  
Army Chemical Center, Md.

CRLR Report 216

AD-34,870

Eight final models of collective protectors are described. In these models, contaminated air is drawn

through a blower which forces the air through a particulate filter to remove aerosols, bacteria, and radioactive dust and then through a gas filter to remove toxic and noxious chemical vapors. The purified air is discharged through 10 ft of flexible tubing with a static pressure at the outlet of at least 2 in. of water. In the four electric-motor-driven models, the air-flow rate is controlled automatically; in the gasoline-engine driven models, an air-flow indicator is provided, and the air is adjusted manually with the engine throttle. To meet the nonstrategic materials requirements, except for motor blowers, the protectors are made from paper, wood, charcoal, cotton cloth, and synthetic rubber adhesive with just enough perforated aluminum to retain the charcoal. It was recommended that collective protectors E28 through E35 be submitted to final engineering tests, and that additional work be conducted on the design of electric- and gasoline-operated motor blowers. (ASTIA)

### 613. PORTABLE AIR SAMPLER FOR COLLECTION OF RADIOACTIVE DUST

Reich, B.

1953

Signal Corps Engineering Laboratories,  
Evans Signal Lab., Belmar, N.J.

Report

AD-23,536

(See also *Nucleonics*, v. 11, p. 63, September 1953)

### 614. RESEARCH PROJECT FOR HIGH-VELOCITY AIR-CLEANING PRECIPITATOR

Hall, H. J.

March 31, 1954

Research Corporation, Bound Brook, N.J.  
Progress Report 3, DA 30-069-ORD-1207

AD-67,590

The salient conclusions from the research program to date may be summarized as follows: (1) The feasibility of using an electrostatic precipitator with an efficiency of the order of 90% to remove fine oil mist from an air stream at an air velocity of 100 ft/sec has been demonstrated on a laboratory scale. (2) The results achieved indicate the desirability of investigating the performance of a two-stage precipitator with the object of materially

reducing the relatively high power requirements of the single-stage type in the tunnel application. In a two-stage precipitator, the corona discharge is confined to a relatively small particle-charging section which is followed by a larger nondischarging collecting section. The Mark II B test precipitator could be modified for these studies and the work could be carried out with funds available from the original appropriation. (ASTIA)

615. AIR CLEANING SEMINAR, AMES  
LABORATORY  
March 1954  
Iowa State University, Ames Lab., Ames  
WASH-149, W-7405-eng-82

The papers presented at this seminar represent a broad attack upon all aspects of air and gas cleaning problems which confront the atomic energy industry. Topics discussed include the removal of soluble gases and particulates from air streams; the performance of reverse jet cloth filters; field studies of commercial dust-collector performance; electrostatically charged aerosol filters; wet cleaning investigations; dissolver of gas filtration; efficiency of reverse-jet filters in U refining operations; removal of bacteria and bacteriophage from the air by glass fiber filters; deepbed sand and glass fiber filters; the properties of aerosols; hygroscopic aerosols; the collection of aerosols on fiber mats; electrification of aerosols; solid waste disposal by incineration using tangential overfire air; the Argonne incinerator program; the performance of the Los Alamos incinerator effluent collector; and noncombustible and chemical-resistant air filters for high and low temperature use. An appendix contains an account of a round-table discussion of air sampling problems in AEC work, and requirements and specifications for sampling media.

616. AN INVESTIGATION OF SAMPLERS FOR  
THE COLLECTION AND CLASSIFI-  
CATION OF RADIOACTIVE AIRBORNE  
PARTICULATE MATERIALS  
April 1954  
Mine Safety Appliances Co., Pittsburgh, Pa.  
Progress Report on Phase 1.9, NObsr-57527  
AD-37,651

This investigation involved the design, construction, and testing of prototype samplers which would collect all particles in a dust cloud so that a separation of the larger and smaller particles would be brought about. This separation was to conform to that which normally occurs in the upper and lower respiratory tracts of human

beings. Because of uncertainty in regard to concentration, density, and radioactivity of the aerosols likely to be encountered, two models of one type of collector and one model of another type were built. All three devices utilized the impingement principle for collection of the large particles, while the remaining smaller particles were collected by thermal precipitation in the two models and by filtration in the third. One of the devices using thermal precipitation was designed to spread the smallest particles collected over a wide area and make their detection possible by a radio-autograph technique. The other device utilizing thermal precipitation was designed to concentrate both aerosol fractions so that detection could be made with an end-window Geiger tube. The model employing filtration was also designed for Geiger tube detection. The three models were capable of accomplishing a separation of aerosols into two fractions containing particles larger and particles smaller than about  $3 \mu$  in diameter. Methods for using similar samplers in determining the relative radioactivity of various size fractions of dust are suggested. (ASTIA)

617. A PORTABLE SELF-CONTAINED AIR  
SAMPLER FOR EMERGENCY USE  
Hounam, R. F.  
September 16, 1954  
United Kingdom Atomic Energy Authority,  
Research Group, Atomic Energy Research  
Establishment, Harwell, Berks, England  
AERE Report HP/M 89  
AD-106,887

An apparatus for sampling airborne dust is described which is based on an air ejector operated by compressed air from an R.A.F. oxygen cylinder. It is capable of sampling 100 l of air per minute for a period of about 20 min. (ASTIA)

618. NEPHELOMETER OF WIDE RANGE FOR  
BACTERIOLOGICAL USE  
Powell, E. O.  
*Journal of Scientific Instruments*, v. 31, no. 10,  
pp. 360–362, October 1954

An instrument is discussed in which light transmitted by suspension is compared with that scattered. The most dense bacterial suspensions normally encountered can be measured without dilution. The instrument behaves approximately like a nephelometer at low concentrations and like an absorptiometer at high concentrations. Performance data and diagrams are given. (EI, 1955)

619. RESEARCH PROJECT FOR HIGH-VELOCITY AIR CLEANING PRECIPITATOR

Hall, H. J.

1954

Research Corporation, Bound Brook, N.J.

Final Report for June 1–October 31, 1954,

DA 30-069-ORD-1207

AD-67,631

The feasibility of applying electrostatic precipitation to the problem of removing small quantities of fine oil mist from an air stream at air velocities as high as 100 fps was demonstrated on a laboratory scale. Collection efficiencies up to 90% were achieved with an average treatment time of 0.09 sec. Good aerodynamic gas-flow conditions were necessary for effecting precipitator performance at high velocities. A two-stage type precipitator was considered best suited for minimizing power consumption and ozone generation for wind-tunnel applications at the Ballistic Research Laboratories, Aberdeen, Md.

620. ANGULAR-DEPENDENCE LIGHT SCATTERING — HIGH-RESOLUTION RECORDING INSTRUMENT FOR ANGULAR RANGE

0.05–140°

Aughey, W. H., Baum, F. J.

*Optical Society of America, Journal of the*, v. 44, no. 11, pp. 833–837, November 1954

An optical instrument for the measurement of light scattering by particles in nonhomogeneous systems is discussed. Scattering data permit the size characterization of optical inhomogeneities in radius range 0.1 to 100 microns. An angular resolution of 0.02 deg is obtainable. The phototube output is charted by a high impedance recorder. (EI, 1955)

621. LIGHT SCATTERING BY POLYDISPERSE DUST CLOUDS

Ellison, J. McK.

*British Journal of Applied Physics*, v. 5, Supplement 3, pp. S66–S71, 1954

When light is scattered by a cloud of particles of a wide range of sizes, the intensity scattered in any direction is built up from the contributions of particles of all dimensions. For forward scattering the relative values of these contributions have been calculated as a function of diameter, by two different approximate formulae for the angular distribution of the light scattered by spheres. The approximations used are: (1) that of Rayleigh and Gans, and (2) Kirchhoff diffraction by opaque circular disks. For the latter, the scattering by a cloud of disks

whose diameters are log-normally distributed with a standard geometric deviation of 2.03 has also been computed. It is concluded that the predominance of the light scattered by larger particles limits the usefulness of light scattering as a means of obtaining a mean particle size to suspensions containing a comparatively narrow range of particle sizes. (PA, 1955, #875)

622. FILTER-TYPE DUST, FUME, AND MIST RESPIRATORS: TESTS FOR PERMISSIBILITY

*Federal Register*, v. 20, no. 76,

April 19, 1955 (S21A)

623. DUST COLLECTORS FOR USE IN CONNECTION WITH ROCK DRILLING IN COAL MINES: TESTS FOR PERMISSIBILITY

*Federal Register*, v. 20, no. 80,

April 23, 1955 (S25A)

624. RADIOACTIVE AIR SAMPLER

Haller, R. B.

April 1955

Mine Safety Appliances Co., Pittsburgh, Pa.

Final Report, NObsr-57527

AD-94,451

625. DETERMINATION OF PARTICLE SIZE DISTRIBUTIONS IN POLYDISPERSED SYSTEMS BY MEANS OF MEASUREMENTS OF ANGULAR VARIATION OF INTENSITY OF FORWARD-SCATTERED LIGHT AT VERY SMALL ANGLES

Chin, J. H., Sliepcevich, C. M., Tribus, M.

*Journal of Physical Chemistry*, v. 59, no. 9, pp. 845–848, September 1955

An experimental technique is described. The apparatus consists of a monochromatic, parallel light source, a dispersion cell, a lens-moving-pinhole receiving unit and a photo-multiplier-potentiometer measuring system. An example of an analysis of a polydispersion of glass spheres in water is given. Close agreement was obtained between the distributions obtained by the experimental technique and the distributions obtained by microscopic counting. (PA, 1956, #1322)

626. RELATIONSHIP BETWEEN THE AIR CONCENTRATION OF RADIOACTIVE FISSION PRODUCTS AND FALLOUT

Blifford, I. H., Jr., Lockhart, L. B., Jr., Baus, R. A.

November 4, 1955

Naval Research Laboratory, Washington D.C.  
Interim Report 4, NRL Report 4607  
AD-81,548

Comparative data on the daily concentration of fission products in the air and the actual fallout on the ground have been collected. For short times after a test, fallout was very much dependent on rainfall. In many cases, the air concentration was affected relatively little. On the average, the apparent rate of fallout was about  $4 \times 10^4$  ft/day. Screens made of cloth or metal mounted on a vane and exposed to the wind were efficient collectors of fission products dispersed in the atmosphere. In some cases, 10 to 100 times as much activity was deposited on a vertical screen as on an equal horizontal area. No definite correlation between gummed paper, screen, and filter collections has been noted. Direct interception by the small fibers of vegetation, as distinguished from simple fallout, may account for a large fraction of the total fission product activity adsorbed on such ground cover. Additional measurements were made on the distribution of activity with particle size by the use of filter media of different retention characteristics.

627. AIR CLEANING STUDIES

Dennis, R., Silverman, L., Billings, C. E., Anderson, D. M., Samples, W. R., Donaldson, H. M., Jr., Drinker, P.

January 15, 1956

Harvard School of Public Health, Boston, Mass.

Progress Report for July 1953–June 1954,  
NYO-4608, Contract AT(30-1)841

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

Progress on the air and gas cleaning project conducted by Harvard University for the Engineering Division of the Atomic Energy Commission during the period July 1, 1953 to June 30, 1954 is discussed. Other yearly progress reports are available. Project objectives include research and development on air and gas cleaning devices and methods for their testing and evaluation. Investigations on (1) the principles of cloth filtration, (2) the role of electrostatic forces in gas cleaning, and (3) studies on resistance and filtration characteristics of fiber beds were continued during the period. New projects included rating of several types of roughing filters, evaluation and testing of strain efficiency techniques, and a study of blast damages to and re-entrainment from high efficiency filters.

628. A STUDY OF THE EFFECTS OF DUST ON ORDNANCE AUTOMOTIVE MATERIEL  
February 1956  
Southwest Research Institute, San Antonio, Texas  
Final Report, DA 23-072-ORD-836  
AD-89, 530

A review of the literature and discussions with qualified personnel are reported on the effects of dust on military automotive-type equipment. Natural dust affects the operation of equipment in two manners: (1) by causing excessive and abnormal wear, and (2) by fouling, plugging, or physically impeding the function of a component. The dust problem is examined in four classifications: physical properties of natural dust, dust elimination, dust tolerance, and engine wear. The problem of snow which is generated by vehicular operation in the Arctic is considered. Dust apparently creates more of a maintenance problem than an engine wear problem. An annotated bibliography is presented which is divided into three parts: civilian articles, military reports, and a cross-index of reference titles. 212 references. (ASTIA)

629. AEROSOLSCOPE COUNTS PARTICLES IN GAS

Gordon, E. S., Maxwell, D. C., Jr.,  
Alexander, N. E.  
*Electronics*, v. 29, no. 3, pp. 188–192,  
March 1956

Method and equipment developed by Armour Research Foundation whereby the chemist is relieved of the tedious job of counting and sizing aerosol particles under a microscope are described. The use of a glow transfer tube counter and a unique pulse height discriminator to count and size particles after scattered light is received by multiplier phototube is discussed. Schematic diagrams are given. (EI, 1956)

630. A PHOTOGRAPHIC METHOD OF ANALYSING AEROSOLS

Richardson, J. F., Wooding, E. R.  
*Journal of Photographic Science*, v. 4, no. 3,  
pp. 75–78, May–June 1956

The variation in size and concentration of particles in an aerosol over short periods of time has been determined by a photographic technique in conjunction with a slit ultramicroscope. The method has been found satisfactory for particle diameters between 0.2 and 4 microns and concentration up to  $10^7$  particles per cm<sup>3</sup>. Some of the disadvantages of the ultramicroscope have been over-

come and the accuracy and reliability of the results have been assessed. (PA, 1957, #8922)

**631. THE DUST ENVIRONMENT AND ITS EFFECT ON DUST PENETRATION**

Pauly, J.

Southwest Research Institute, San Antonio, Texas  
Final Report for December 1, 1955 to  
September 28, 1956, WADC TR 56-556,  
AF 33(616)3280  
AD-110, 472

A review was made of the sand and dust tests to develop, if necessary, new procedures for an economical and realistic dust test for the evaluation of Air Force equipment for use in an environment of extreme dust. A review of the literature was also made, and research was conducted to isolate some of the factors which promote dust penetration. Three basically different types of laboratory tests are used: (1) wear or erosion, (2) filtration, and (3) dust penetration. The effects of dust on equipment operation can be classified as increased wear, binding, and clogging, and are causes of failure and additional maintenance, replacement, and repair. The literature survey disclosed that mechanically generated dust is probably more severe than a climatic dust storm on equipment, and also that there are no numerical data available which may be used to define dust conditions. Properties by which a dust environment can be analyzed and classified include concentration, size, composition, hardness, abrasiveness, shape, and the tendency to agglomerate. Three rectangular box-like test fixtures having apertures 0.003, 0.005, and 0.009 in. wide were devised for trapping dust in a dust chamber and evaluating the given dust condition on the amount of penetration produced. Some factors which influence penetration are exposure time, concentration, air velocity, air temperature, particle size, and relative humidity. Studies were made of each of these factors. Both mechanical and electrical type equipment were subjected to various dust environments while functioning under a variety of conditions in order to substantiate the specimen studies; reproducible results were difficult to obtain. 383 references. (ASTIA)

**632. PROTEIN CONTENT OF AIR**

Tabor, E. C.

1956

Robert A. Taft Sanitary Engineering Center,  
Cincinnati, Ohio  
Final Report, CD-4-4431  
AD-112,816

A modified version of a commercially available high-volume sampler and a glass-fiber filter medium were used to determine the protein content of air particulate matter. Active sampling was conducted at 68 locations in 22 communities of the U.S. In most areas, a minimum of two sampling sites was chosen, one representing the business area and the other the residential or rural areas. Attempts were made to obtain at least one sample per week at each sampling site. The standard ninhydrin reaction of Troll and Cannan for the measurement of the products of protein hydrolysis was used as a basis for the development of analytical procedures. Three modifications (Methods I, II, and III) of the original procedure were introduced, each giving a greater specificity for the substances to be determined. A total of 1691 samples was analyzed, 459 by Method I, 468 by Method II, and 764 by Method III. With those stations represented by over 10 samples, average protein levels, as measured by Methods II and III, ranged from a maximum of  $4.7 \mu\text{g}/\text{m}^3$  to a minimum of  $0.6 \mu\text{g}/\text{m}^3$ . With data obtained by Method III, and including all stations regardless of the number of samples collected, the maximum was  $4.5 \mu\text{g}/\text{m}^3$  with a minimum of  $0.7 \mu\text{g}/\text{m}^3$ . Twenty-three stations showed the highest values in spring, 18 in summer, 5 in fall, and 1 in winter. Very little evidence was found of a diurnal variation in protein levels. An average of 38% of the total protein may occur in the particles below about  $5\mu$  in diameter. No pronounced differences were found in protein values at different elevations at the same location. No correlation could be found between the amount of acetone-soluble organic materials and the protein content of samples from several cities. (ASTIA)

**633. THE SCATTERING OF LIGHT BY SPHERICAL AND ROD-SHAPED PARTICLES OF WAVELENGTH ORDER OF MAGNITUDE**

Burberg, R.

*Zeitschrift für Naturforschung*, v. 11a, no. 10,  
pp. 807–819, 1956 (in German)

Formulae are developed for the evaluation of light-scattering measurements on the suspensions of large viruses and similar biological material. In particular, correction terms to the Debye formula for the scattered intensity for the two most important particle shapes—spheres and rods—are computed, and the error in applying this formula to other shapes is estimated. It is assumed that the incident wave is linearly polarized. (PA, 1959, #1343)

634. MECHANICAL GRIT AND DUST COLLECTORS

Johnson, J. C., Goodwin, G. C.

In "Proceedings of Conference on Mechanical Engineer's Contribution to Clean Air, London, England, February 19-21, 1957," pp. 60-76 Institute of Mechanical Engineers, London, England, 1957

635. COMPARISON TYPE NEPHELOMETER

Wright, W. F.

*The Review of Scientific Instruments*, v. 28, no. 2, pp. 129-134, February 1957

Nephelometer for measuring turbidities by both absorption and scattering of light is discussed. Specially designed cells permit accurate measurement of small changes in intensity of either transmitted or scattered light over a wide range of intensities. The reproducibility of resetting in normal operating range is two parts in 10,000. The apparatus operates over a range of more than five density units. Its use in bacteriological, silica gel, and colorimetry studies is considered. (EI, 1957)

636. PROCEEDINGS OF GOLDEN JUBILEE MEETING OF AIR POLLUTION CONTROL ASSOCIATION, JUNE 2-6, 1957, ST. LOUIS, MO.

Air Pollution Control Association, Pittsburgh, Pa.

Among the papers presented were the following: "Procedures for Making Inventory of Air Pollution Emissions," A. T. Rossano, Jr., N. E. Schell, 6 pages; "ASHRAE Air-Borne Dust Survey," K. T. Whitby, A. B. Algren, R. C. Jordan, J. C. Annis, 9 pages; "Use of Sticky Paper in Air Pollution Monitoring Program," C. W. Gruber, G. A. Jutze, 3 pages; "Automatic Programming Filter Sampler," G. S. Raynor, 3 pages; "Estimation of Water Soluble Chlorides, Sulphates, and Nitrates in Suspended Atmospheric Dusts," C. Gelman, 4 pages; "Dust Retention Efficiencies of Dust-fall Collectors," J. S. Nader, 4 pages; "Dust and Mist Collection," K. E. Lunde, C. E. Lapple, 8 pages; "Continuous Instrumentation for Atmospheric Analyses," L. H. Rogers, 5 pages; "Fifty Years of Electrostatic Precipitation," H. J. White, 12 pages; "Further Investigations of Continuous Slag Wool Filter," C. E. Billings, L. H. Levenbaum, C. Kurker, Jr., E. C. Hickey, L. Silverman, 12 pages; "Results of Three Years of Operation of National Air Sampling Network," A. C. Stern, 5 pages. (EI, 1958)

637. PROCEEDINGS FOR ENGINEERING SEMINAR ON ELECTROSTATIC PRECIPITATION, JUNE 17-21, 1957  
Pennsylvania State University, University Park, Pa.

Among the papers presented were: "Fifty Years of Electrostatic Precipitation," H. J. White, 31 pages; "Basic Concepts," H. J. White, 11 pages; "Particle Charging in Electrostatic Precipitation," H. J. White, 6 pages; "Electrostatic and Mechanical Collection of Fly Ash," S. R. Orem, 3 pages; and "Interpretation of Measurements in Electrostatic Precipitation," G. W. Penney, 5 pages. (EI, 1960)

638. JOY MICRODYNE DUST COLLECTOR... TO CONTROL DUST IN INDUSTRY

Davis, L. E.

*Canadian Mining Journal*, v. 78, no. 6, pp. 123-125, June 1957

This compact wet inertial dust collector lends itself to duct installation and consists of mixer section, separator section, transition, and an Axivane fan with an adjustable blade pitch. Dust-laden air enters the collector through the mixer section, passing over the spray header and through the mixing element. It may be used in mining operations. (EI, 1960)

639. MEASUREMENTS OF CHARGE IMPARTED TO FINE PARTICLES

*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 76, no. 31, pp. 294-306, July 1957

This article incorporates two related papers on charge of small particles: "Measurement of Charge Imparted to Fine Particles by Corona Discharge," G. W. Penney, R. D. Lynch, pages 294-299; and "Charging of Small Particles for Electrostatic Precipitation," G. W. Hewitt, pages 300-306. (EI, 1958)

640. AUTOMATION—KEY TO MORE EFFICIENT DUST COLLECTION

Beaver, C. E.

*Combustion*, v. 29, no. 2, pp. 41-43, August 1957

This electronic feedback control device, known as "Cottrell Automation System," provides constant maintenance of proper balance between load characteristics and power input to precipitator. It controls precipitator power input for the three most common operating con-

ditions under which current, voltage, or sparking rate may be limited. A block diagram is presented of major elements involved, and the basic operation explained. (EI, 1960)

**641. OPTICAL STUDIES OF PARTICULATE MATTER IN THE SEA**

Ketchum, B. H., Shonting, D. H.

February 1958

Woods Hole Oceanographic Institute, Mass.

Technical Report, Nonr-221900

AD-157,819

A study of particulate matter distribution using the light-scattering photometer was made on the recent Atlantis cruise 240 to the Cariaco Trench in the Caribbean Sea. This trench is a basin off the coast of Venezuela which is anaerobic below the depths of about 375 m. On a previous expedition to the trench in 1955, much physical and chemical data were obtained concerning the water properties, both above and below the anaerobic interface at 350 to 400 m. A relatively large amount of hydrogen sulfide was found at greater depths to the bottom. However, no data were collected on the distribution of concentration of particulate matter in the waters of the trench other than two Secchi disc readings. On the recent cruise, five successful lowerings of the light-scattering photometer were made: two near the center of the basin, one on the eastern sill, one on the western sill of the trench, and one in St. George's Harbor, Grenada, B.W.I. This latter station gave a relative comparison of light scattering of the trench waters with that of shallow harbor water in the same latitude. Several Secchi disc readings were taken in the trench to supplement scattering data. A discussion of the light-scattering data of the trench waters and its relationship to the dynamics of the water in the general area of the trench is presented. A comparison is made with the light scattering and Secchi disc reading of both the trench and the continental shelf waters. In addition, a theoretical relationship of scattering intensity with extinction coefficient is derived. Turbidity measurements are compared with other oceanographic data. (ASTIA)

**642. PARTICULATE EMISSION—PROCEEDINGS OF SYMPOSIUM ON AIR POLLUTION, PHILADELPHIA, OCTOBER 21, 1957**

March 1958

Franklin Institute of the State of Pennsylvania,  
Philadelphia

Franklin Institute Journal Monograph 4

The following papers were presented at the Symposium on Air Pollution, October 21, 1957, Philadelphia, Pa.: "Particulate Emissions in Community Air Pollution," F. E. deMartini, pages 3-20; "Atmospheric Pollution Sampling," J. Z. Holland, pages 21-36; "Measuring Human Reactions to Air Pollution," J. J. Phair, G. C. R. Carey, and R. J. Shephard, pages 37-51; "Community Planning for Air Pollution Control," G. P. Larson, pages 53-59; "Removal of Particulate Matter From Gas Streams," W. C. L. Hemeon, pages 61-73; "Modern Municipal Incinerator," A. Michaels and W. E. Frank, pages 75-92; "Fly Ash Abatement in Philadelphia Electric Co.," D. F. Schick, Jr., pages 93-97. (EI, 1958)

**643. ASHRAE AIRBORNE DUST SURVEY**

Whitby, K. T., Algren, A. B., Jordan, R. C.,  
Annis, J. C.

*Air Pollution Control Association, Journal of the,*  
v. 7, no. 3, pp. 157-165, November 1957

(See also *Heating, Piping and Air Conditioning*,  
v. 29, pp. 185-192, November 1957)

The results are presented of the first part of the ASHRAE survey to determine airborne dust properties that have an effect on performance of air cleaners. The properties determined were: concentration of fibrous and fine particles, stain concentration, particle size distribution, particle density, and porosity of packed sediment and dust fall. (EI, 1958)

**644. CERTAIN ASPECTS OF DEPOSITION OF DUST**

Lucas, D. H.

*Institute of Fuel, Journal of the,*  
v. 30, no. 202, pp. 623-627, November 1957;  
(discussion) v. 31, no. 1, pp. 32-41, January 1958

Experiments were carried out which show that a deposit gage at ground level collects far more dust than a gage 4 ft above ground. It is concluded that much of this additional catch is dust re-entrained from the ground; only one quarter of the dust collected in deposit gages in rural districts around Little Barford Power Station originated at the power station. (EI, 1958)

**645. EXPERIMENTAL INVESTIGATION OF CRITICAL DESIGN FACTORS FOR VANE-TYPE CYCLOONES**

Walker, A. B., Cole, W. H.

*ASME Transactions*, v. 79, no. 8, pp. 1715-1721,  
November 1957

A study of effects of tube size, inlet vane design, and utilization of outlet tube vanes on the performance of a multiple-tube collector was made. The critical nature of these factors and methods for obtaining higher efficiency and gas flow are demonstrated. A comparison between predicted field results from laboratory tests and actual field results is given. (EI, 1958)

646. STAUB ALS LADUNGSTRAEGER  
(DUST AS A CHARGE CARRIER)

Feifel, E.

*Rader Rundschau*, no. 7, pp. 904–917,  
December 1957

The static electric charge of a cloud of dust in a gas/dust mixture which moves in a pipe with whirling spiral motion can be measured in a simple manner by grounding the "excited pipe" over a galvanometer. The limit values of total electric charge which may be carried by dust particles are discussed. Numerous measurements made on various types of dust and results obtained from flue dust are presented. (EI, 1958)

647. EINFLUSS ELEKTROSTATISCHER  
AUFLADUNGEN AUF DAS VERHALTEN  
VON STAUBSYSTEMEN (EFFECT OF  
ELECTROSTATIC CHARGES ON  
BEHAVIOR OF DUST CONTROL SYSTEMS)

Haase, H., Hardtke, B. H.

*Chemie-Ingenieur-Technik*, v. 29, no. 12,  
pp. 814–816, December 1957

The causes of agglomerate formation and adherence of dry powdery substances are discussed. The equation of state is given, with the aid of which facts concerning several special problems can be presented. (EI, 1958)

648. INVESTIGATION OF A SOLID  
COMPONENT OF INTERPLANETARY  
MATTER BY MEANS OF ROCKETS AND  
ARTIFICIAL EARTH SATELLITES

Poloskoff, C. U., Nazarova, T. N.

Zygelbaum, J. L., Translator

*Uspekhi Fizicheskikh Nauk*, v. 53, no. 1,  
pp. 253–265, 1957

649. MAKING A CHOICE OF DUST  
COLLECTORS

Duncan, D. M.

*Design Engineering*, v. 4, no. 1, pp. 34–35, 57,  
January 1958

Relative merits of cyclone and cabinet-type dust collectors are compared. The cyclone type is usually used with buffering wheels when dust volume is large. The cabinet type is most widely used when dust needing removal is very gritty. (EI, 1960)

650. MIST AND DUST COLLECTION  
EQUIPMENT

Ranz, W. E., Hofelt, C., Jr.

*Industrial Wastes*, v. 3, no. 1, pp. 1–6,  
January–February 1958

A review of general methods of mist and dust collection, and the operation of common types of equipment for direct filtration, inertial separation, and electrostatic precipitation is given. Other factors considered are operating costs, capacity limiting factors, and removal of collected material. (EI, 1960)

651. AIR CLEANING; ROTONAMIC FILTER

*The Engineer*, v. 205, p. 258, February 14, 1958

652. DUST ELIMINATION IN METAL WORKING

Williams, A. E.

*Metal Industry*, v. 92, no. 7, pp. 130–132,  
February 14, 1958; no. 8, pp. 147–149,  
February 21, 1958

The Sylvan chart is presented which shows range of particle size, concentration, and collector performance. Collector systems and design are described (February 14). Installations for collecting magnesium dust, exhaust ventilation and dust control equipment in foundry sand handling systems, and the air supply are discussed (February 21). (EI, 1958)

653. FILTERING FIBERGLASS

*Engineering*, v. 185, p. 255, February 21, 1958

654. FILTERING RADIOACTIVE PARTICLES  
FROM STACK GAS

Anderson, H. E.

*Air Conditioning, Heating, and Ventilating*,  
v. 52, no. 2, pp. 71–76, February 1958

An evaluation of various devices for filtering particulate radioactivity from radiochemistry off-gas systems to prevent air pollution from stack gas wastes is presented. Problems of atmospheric radioactive contamination devices reviewed as a basis for selection of equipment include the Hersey reverse jet filter, baffleplate scrubbing tower, Venturi scrubber, electrostatic precipitator, and others. (EI, 1960)

655. DUST AND MIST COLLECTION—  
CRITIQUE ON STATE OF ART

Lunde, K. E., Lapple, C. E.

*Air Pollution Control Association, Journal of the,*  
v. 7, no. 4, pp. 289–296, February 1958

A summary of basic performance principles of equipment is given. Major problems in measurement techniques and specific areas for potential development are included. (*EI*, 1960)

656. AIR CLEANING WITH ELECTROSTATIC  
PRECIPITATORS

Prasad, B. K. R.

*Electrical Energy*, v. 2, no. 2, pp. 66–68,  
February 1958

The principle of dust precipitation is discussed, and details are given of equipment which uses voltages of the order of only 6 to 13 kv, and thus generates little "ozone." (*EI*, 1960)

657. DUST CONTROL—WET COLLECTOR HAS  
WIDE PROCESS APPLICATIONS

Seifert, H. E.

*Southern Power and Industry*, v. 76, no. 2,  
pp. 42–43, 104, February 1958

A collector for lightweight aggregate dusts at the Brevo Bluff, Virginia, plant of Southern Lightweight Aggregate Corporation is made of specially treated wood for resistance to both heat and acid. It eliminates 90% of dust coming from the crushing of slate and fly ash from powdered fuel. Its applicability to fertilizer plants, incinerators, clay processing plants, rock products, etc., is shown. (*EI*, 1960)

658. RESULTS OF THREE YEARS OF  
OPERATION OF NATIONAL AIR  
SAMPLING NETWORK

Stern, A. C.

*Air Pollution Control Association, Journal of the,*  
v. 7, no. 4, pp. 284–288, February 1958

Chemical procedures to determine protein in pollen and other material suspended in atmosphere are explained. The content of material collected on filters is investigated. Also considered are suspended particulate loading and organic fraction, analysis of inorganic materials, radioactivity of suspended particulate, and utilization and interpretation of network data. (*EI*, 1958)

659. REPORT OF A NEW METHOD FOR  
STUDYING AIR POLLUTION

Bourne, H. G., Jr.

*Heating, Piping, and Air Conditioning*,  
v. 30, no. 3, pp. 139–141, March 1958

The procedure includes the use of a portable electrostatic air sampler and polyethylene canisters. For ten months, measurements were made of contaminants from a ferromanganese plant. At 1 to 2 mi from the plant, the total dust and fume averaged  $1500 \mu\text{g}/\text{m}^3$ , of which manganese was 2 to 30  $\mu\text{g}$ , and silica, 5 to 85  $\mu\text{g}$ . (*EI*, 1958)

660. INDUSTRIAL ODOR PROBLEM—SOLVED

Quinlan, J. C.

*The American City*, v. 73, no. 3, pp. 121–122,  
March 1958

A method is developed in which water precipitators check community-wide fumes and dust nuisances from a rubber reclaiming plant near Buffalo, N.Y. Units used are Type A Hydro Precipitator Scrubbers, suited to removing microscopic solids, fumes, and odors from exhaust gases. (*EI*, 1960)

661. AUTOMATIC CONTROL OF ELECTRICAL  
PRECIPITATION RECTIFIERS

Van Hoesen, H. E., White, H. J., Hall, H. J.

*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 77, no. 35,  
paper 58–229, pp. 126–128,  
March 1958

A new automatic control system incorporating voltage, current, and spark rate as control parameters is described. This system is no substitute for a properly designed high efficiency precipitator, but nevertheless is broadly applicable to industrial electric precipitation. (*EI*, 1958)

662. APPLICATION OF SILICON RECTIFIERS  
TO ELECTROSTATIC PRECIPITATOR  
POWER SUPPLIES

Willison, R. E.

*Direct Current*, v. 3, no. 8, pp. 248–251,  
March 1958

The advantages of silicon rectifiers over tube and selenium rectifiers for precipitator applications are discussed. An oil-immersed silicon rectifier set installed at Milliken Station of New York State Electric and Gas Company is described. New developments are listed. (*EI*, 1960)

663. ÉTUDE THÉORIQUE DU DÉPOUSSIERAGE PAR CENTRIFUGATION (A THEORETICAL STUDY OF CENTRIFUGAL DUST REMOVAL)  
Comolet, R.  
*Chaleur et Industrie*, v. 39, no. 393, pp. 87–106, April 1958

A theory of axial cell dust collectors and a calculation of the movements of particles in fluid stream when in rotation are given. The loss of charge in gyratory flow and determination of efficiency of cyclone dust collectors are also discussed. (*EI*, 1960)

664. WET DUST-COLLECTION EQUIPMENT  
Smith, E. M.  
*Cost Engineering*, v. 3, no. 2, pp. 49–54, April 1958

Basic factors influencing selection of appropriate dust collection equipment are given. A table to be used to determine the particular type of equipment for a given job is offered. Reference is made to the basic unit of National Hydro-Filter, without means for moving gas and liquid or for handling collected dust. The integral unit is discussed, including air, liquid, and sludge handling accessories. Also considered are materials of construction, equipment and operating costs, and maintenance. (*EI*, 1959)

665. MIKRO-PULSAIRE DUST COLLECTOR WITHOUT MOVING PARTS  
*Manufacturing Chemist and Pharmaceutical and Fine Chemical Trade Journal*, v. 29, pp. 163–164, April 1958

666. BARBED ELECTRODES, A NEW IDEA IN DUST CONTROL  
*Rock Products*, v. 61, p. 101, April 1958

667. STACK SPRAYS SOLVE SOOT PROBLEMS  
*Coal Utilization*, v. 12, no. 4, pp. 33–34, April 1958

Dust emission from boiler stacks during soot blowing or fire cleaning can be reduced, according to laboratory tests conducted by Bituminous Coal Research, Inc. The cost of installing a stack spray is low, and results show that 60 to 80% of solids in the stack spray zone can be collected. The amount of water required, the selection of spray nozzles, and the installation and automatic control of spray nozzles are discussed. (*EI*, 1960)

668. STATIC AUTOMATIC CONTROL FOR ELECTRICAL PRECIPITATORS  
Little, L. L.  
*Combustion*, v. 29, no. 11, pp. 55–57, May 1958  
(See also *Blast Furnace and Steel Plant*, v. 46, no. 7, pp. 711–713, July 1958)

A theoretical basis of a new system for regulating input power developed for use with Cottrell process electrical precipitators is given. The operation, design and performance of portable automatic controls installed on several precipitators are also considered. (*EI*, 1958)

669. DUST RETENTION EFFICIENCIES OF DUSTFALL COLLECTORS  
Nader, J. S.  
*Air Pollution Control Association, Journal of the*, v. 8, no. 1, pp. 35–38, May 1958

Dustfall collectors representing three collection techniques were exposed to atmospheric dustfall under weather conditions typical of temperature climate. Statistical evaluation of gravimetric analysis data and dust retention efficiencies shows no significant differences among three types of collections. (*EI*, 1958)

670. ENGINEERING DESIGN FACTORS IN DUST AND FUME RECOVERY SYSTEMS  
O'Mara, R., Flodin, C. R.  
*Air Pollution Control Association, Journal of the*, v. 8, no. 1, pp. 39–45, May 1958

Systems are discussed in which gases are vented to the atmosphere and are not reused. Factors in the design of present systems, compatible with plant economics and community health regulations are considered in addition to problems of plant relocation. Tables show electrical precipitator efficiency, collection equipment selection, applications, range of loadings, and particle sizes. (*EI*, 1960)

671. MODELS USED TO DETERMINE CORRECT FLOW OF GASES TO PRECIPITATORS  
*Blast Furnace and Steel Plant*, v. 46, no. 5, pp. 493–495, May 1958  
(See also *Air Conditioning, Heating and Ventilating*, v. 55, no. 6, pp. 74–76, June 1958; *Combustion*, v. 29, no. 12, pp. 41–45, June 1958; *Iron and Steel Engineer*, v. 35, no. 3, pp. 181–182, 184, 186, March 1958)

Delineated in these articles are transparent plastic models employed by Research-Cottrell to study flue de-

sign. Areas in which savings can be achieved have been indicated by two years of flue design involving 10 working models. Increasing capacity of precipitators, lower construction costs, savings in precipitator design, and a model built to determine best design of flue between air heater and mechanical collector preceding electrostatic precipitator are also considered. (*EI*, 1960)

**672. SCRUBBER COMBINES HIGH COLLECTION EFFICIENCY WITH ECONOMICAL OPERATION**  
*Iron and Steel Engineer*, v. 35, no. 5, p. 143, May 1958

Consolidated Mining & Smelting Co. of Canada has developed the Turbulaire-Doyle Scrubber which impinges dust-laden gas at high velocity into a pool of scrubbing liquid. Gas cleaning and cooling applications have shown highly satisfactory results at relatively low power consumption, low liquid-to-gas and low liquid-to-dust ratios. (*EI*, 1960)

**673. MEASUREMENT OF DUST CONCENTRATION IN GASES**  
*Engineering*, v. 205, p. 864, June 6, 1958

**674. COMPARATIVE STUDY OF PRESENT-DAY DUST SAMPLING METHODS IN MINES**  
Misra, G. B.  
*Mining, Geological and Metallurgical Institute of India, Transactions of the*, v. 55, no. 1, pp. 37-49, June 1958

Sampling instruments are classified by mode of collection: filtration, condensation, washing, sedimentation, impingement, thermal precipitation, electrical precipitation, impaction, centrifuging, and optical methods. Considerations in choosing a proper filtering method and characteristics and comparisons of existing dust sampling instruments are discussed. (*EI*, 1960)

**675. SOME MEASUREMENTS OF ABNORMAL CORONA**  
Penney, G. W., Hewitt, J. G., Jr.  
*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 77, no. 37, paper 57-87, pp. 319-327, June 1958

Measurement of abnormal corona for the charging of particles is given. Investigated are "flare type" of corona occurring when active electrode is positive and corona is

due to high-resistivity dust on large or passive electrode. Pertinence to electrostatic precipitation of dust is explained. (*EI*, 1960)

**676. ELECTROSTATIC PRECIPITATORS**

Plass, R. J., Haaland, H. H.  
*Rock Products*, v. 61, no. 7, pp. 104-105, 108, 110, 136, 138, 140, July 1958

Kiln gases far outweigh other materials yielded by kiln. The alkali fumes are difficult to precipitate. Sulphur causes hard crusty deposits of SO<sub>3</sub> on electrodes and other internal members of precipitator. The wet process is most favorable for electrical precipitation. Information is given concerning mechanical dust collectors and bag-houses. A new application of precipitation in air-swept raw and finish grinding mills and in rock and shale dryers is outlined. (*EI*, 1960)

**677. DUST SAMPLING: ISOKINETIC SAMPLING APPARATUS**  
*Engineering*, v. 186, p. 230, August 22, 1958

**678. MECHANICAL DUST COLLECTOR FOR URANIUM MILLS**  
*Engineering*, v. 186, p. 497, October 17, 1958

**679. DISCIPLINING DUST**  
Vedder, W. O.  
*Pit and Quarry*, v. 51, no. 4, pp. 112-115, October 1958

Factors to be considered in planning for a minerals processing plant are: exhaust hoods and piping system, dust collecting equipment, and exhauster and its drive. Types of collectors are: settling chamber, wet collector, centrifugal collector, and cloth filter. A table shows velocities recommended for conveying various dusts. Fans of high efficiency are needed in the exhauster. Proper dust control improves plant working conditions, eliminates public nuisance, reclaims usable materials, and cuts wear on equipment. (*EI*, 1960)

**680. MODEL CHECKS COLLECTOR DESIGN**  
Moore, W. W., Knecht, H.  
*Electrical World*, v. 150, no. 19, pp. 78, 82, November 10, 1958

Model studies by Consolidated Edison Co. of New York, and Research-Cottrell, Inc., were made to check calculations and designs of two fly ash collectors, by

means of gas flow distribution. Results of these studies and a description of a 1/16-scale plexiglas model are given. (EI, 1959)

681. SAMPLING INDUSTRIAL DUSTS,  
WATSON BRITISH TYPE KONIMETER  
*Engineering*, v. 186, p. 647, November 14, 1958

682. HIGH VOLTAGE RECTIFIERS IN THE  
IRON AND STEEL INDUSTRY  
Hanson, E.  
*Metropolitan-Vickers Gazette*, v. 29, no. 472,  
pp. 293–297, November 1958

An account is given of the rectifying equipment in the blast furnace gas cleaning plant at Shotton steelworks of John Summers, Ltd. Two synchronous mechanical rectifiers are used, with a static selenium-iron rectifier as a standby. Details on voltage regulation, high-voltage selector switches, and an air conditioning plant for the precipitator substation are given. (EI, 1959)

683. INFLUENCE OF POWER INPUT ON  
EFFICIENCY OF DUST SCRUBBERS  
Semrau, K. T., Marynowski, C. W., Lunde, K. E.,  
Lapple, C. E.  
*Industrial and Engineering Chemistry*,  
v. 50, no. 11, pp. 1615–1620, November 1958

A total-power-input correlation method suggested by C. E. Lapple and H. J. Kamack is applied to the Venturi, cyclonic spray (Pease-Anthony) and pipeline pilot plant scrubbers. Units and test procedures are outlined. Results support the previous conclusion that the controlling factor in scrubber performance is turbulence, and total power input (or power dissipated) per unit of gas flow rate might be the general criterion of efficiency. (EI, 1959)

684. TROUBLE-SHOOTING MECHANICAL  
DUST COLLECTORS  
Archer, W. E.  
American Society of Mechanical Engineers,  
New York, N. Y.  
Paper 58-A-283, presented at ASME Meeting,  
New York, N.Y., November 30–December 5, 1958  
(See also *Pit and Quarry*, v. 51, no. 7, pp. 132–137,  
January 1959; *Blast Furnace and Steel Plant*, v. 47,  
no. 2, pp. 192–198, February 1959)

Preventive and corrective maintenance for mechanical dust collectors is discussed. Considered in the discussion are the effect of duct design on collector efficiency; the effect of hopper circulation on efficiency; the plugging of collecting tubes; the accelerated wear resulting from poor dust distribution in a gas stream; and the manner in which contaminated stack discharges lower efficiency below minimum requirements. (EI, 1959)

685. ZUR KENNTNIS DER ABSCHEIDUNG  
VON FLUGSTAUB IM ELEKTROFILTER  
(THE SEPARATION OF FLUE DUST IN AN  
ELECTRIC FILTER)  
Scheidel, C., Eishold, H. G.  
*ETZ (Elektrotechnische Zeitschrift)*, Ausgabe A,  
v. 79, no. 24, pp. 953–955, December 11, 1958

The improvement of the separation obtained by using point discharge in combination with a spraying system consisting of smooth wires is discussed. Electronic wind, generated by special shape of electrodes, is shown to contribute essentially to the cleaning process by causing directional dust separation. (EI, 1959)

686. TROUBLESHOOTING DUST COLLECTORS  
Archer, W. E.  
*Chemical Engineering*, v. 65, pp. 188+,  
December 15, 1958

687. HOW TO GET RID OF DUST  
Vlahos, C. J.  
*Mill and Factory*, v. 63, no. 6, pp. 95–98,  
December 1958

The use of dust collectors is proposed to reduce air pollution, prevent damage to machines and products, improve the working environment, and salvage materials. A method of selecting the right collector is suggested. A table presents 14 types of collectors, with technical descriptions, uses, and limitations of each. Drawings show dust collector types. (EI, 1959)

688. APPLICATION OF JOY MICRODYNE TO  
MINING INDUSTRY  
Barrett, A. L.  
*Missouri, University of, School of Mines and  
Metallurgy, Bulletin of the, Technical Series*,  
no. 95, pp. 19–30, 1958

The impingement section of the collector consists of a folded 14-mesh stainless steel wire screen which is

wetted by an upstream spray. The dust laden water leaving the wire screen is removed from the air stream by centrifugal force. Turning energy induced in the air is later removed at the exit end of the dust collector with a set of straightening vanes. (*EI*, 1958)

689. PRINCIPLES OF INERTIAL IMPACTION

Ranz, W. E.

1958

Pennsylvania State University, Dept. of  
Engineering, University Park  
Research Bulletin 66

A survey was made of information applicable to the analysis of mist and dust collectors, resulting in a theoretical analysis of the impaction efficiencies of nearly all types of inertial separation equipment interpreted in terms of a few basic flow systems. Graphs and sample calculations are presented. (*EI*, 1959)

690. VENTURI-SCRUBBER ON LIME KILN  
STACK GASES

Collins, T. T., Jr.

*Tappi*, v. 42, no. 1, pp. 9–13, January 1959

A study was made relative to recovery furnaces at sulphate pulp mills. A literature review is included. Comparative test data are presented for various units, including the Pease-Anthony Venturi Scrubber and a modification called Chemico S-F Venturi Scrubber. Efficiencies of about 99% removal of lime dust are achieved. Tests showed 63 to 80% removal of soda fume, which has smaller particle size than lime dust mechanically entrained in kiln gases. (*EI*, 1959)

691. COLLECTION OF GAS-BORNE DUST  
PARTICLES BY MEANS OF AN ASPIRATED  
SAMPLING NOZZLE

Badzioch, S.

*British Journal of Applied Physics*, v. 10, no. 1,  
pp. 26–32, January 1959

Efficiency is shown theoretically to depend on the ratio of the velocity of aspiration into the sampling nozzle to the velocity of undisturbed gas stream, and the ratio of length representing distance of disturbance upstream of nozzle to range of particle. Range is defined as the distance a particle would travel, before coming to rest, if projected into still gas with a velocity equal to that of the gas stream. (*EI*, 1959)

692. OCHISTKA TEHNOLOGICHESKIH  
GAZOV S VYSOKOI TEMPERATUROI V  
TSENTROBEZHNO-PENNOM  
PYLEULOVITEIE (PURIFICATION OF  
HIGH TEMPERATURE TECHNICAL GASES  
IN CENTRIFUGAL DUST COLLECTORS)  
Savraev, V. P.  
*Tsvetnye Metally*, v. 32, no. 1, pp. 62–70,  
January 1959

A centrifugal dust collector was compared with high-speed turbulent dust collectors. Data are presented on dust collecting practices in nonferrous metallurgical plants. (*EI*, 1959)

693. UNTERSUCHUNGEN UEBER DAS  
RUECKSPRUEHEN BEI DER  
ELEKTRISCHEN STAUBABSCHIEDUNG  
(INVESTIGATION OF BACK DISCHARGE  
IN ELECTRIC DUST PRECIPITATION)  
Simm, W.  
*Chemie-Ingenieur-Technik*, v. 31, no. 1, pp. 43–49,  
January 1959

Reduction of efficiency by back ionization in the precipitation of dusts with high electrical resistivity is studied at 150°C on iron sulphate, iron oxide, zinc oxide, coal, lignite, cement, magnesium oxide, and fly ash. Results show that this condition is favored by high resistivity and current density, and small dust layer depth. (*EI*, 1959)

694. VERGLEICHMESSUNGEN MIT  
VERSCHIEDENEN STAUBMESSVERFAHREN  
(A COMPARISON OF VARIOUS METHODS  
FOR MEASUREMENT OF DUST FALL)  
Effenberger, E.  
*Staub*, v. 19, no. 2, pp. 44–46,  
February 1959

Measurements carried out during a 12-month period with the Diem adhesion foil method, Loebner dust collection apparatus, and Effenberger registering appliance are compared. Statistical correlations were found between results obtained with various devices. (*EI*, 1959)

695. AEROSOL SPECTROMETER: A NEW  
INSTRUMENT FOR THE ANALYSIS OF  
AIRBORNE PARTICLES IN THE  
SUBMICRON RANGE  
Goetz, A.  
*Public Works*, v. 90, pp. 91–93, February 1959

Gaseous irritants may be intensified if they react with aerosol particles of salt, oils, etc. The Aerosol Spectrometer for the precipitation and concentration of natural and artificial aerosols in the submicron range was used by the California Institute of Technology. A channel guides the air to flow in the form of a helix on a surface of a conical rotor which can spin at about 25,000 rpm; three velocity components are involved. A deposit is collected on special foil. (*EI*, 1959)

696. UEBER DIE PRUEFUNG VON FILTERN  
ZUR ABSCHEIDUNG RADIOAKTIVER  
AEROSOLE (TESTING OF FILTERS FOR  
PRECIPITATION OF RADIOACTIVE  
AEROSOLS)

Hasenclever, D.

*Staub*, v. 19, no. 2, pp. 37–43,  
February 1959

Features of three different test arrangements at the Dust Research Institute, Bonn, are presented, based on the use of quartz dust, paraffin oil smoke, or radioactive suspended matter less than  $0.3 \mu$  in diameter. Only combined testing by all three methods permits comprehensive evaluation of filter usefulness in precipitation of liquid or solid aerosols, ranging from submicroscopic size to  $10 \mu$ , from flowing gas. (*EI*, 1959)

697. DETERMINING IMPACTION EFFICIENCIES  
OF MIST COLLECTION EQUIPMENT

Ranz, W. E., Katz, E. J.

*Air Pollution Control Association, Journal of the*,  
v. 8, no. 4, pp. 328–332, February 1959

Using over-all ability for particle removal as a criterion, a sampling system was designed to establish conditions where some, but not all, particles are removed, thereby revealing basic limitations on collector performance. A 4000-scfm open-circuit air-flow system is the main feature of this test equipment. A method of analyzing experimental impaction efficiencies is described. The conclusions show that this system gives constant and reproducible results. (*EI*, 1959)

698. DETERMINATION OF MICRON-SIZED  
PARTICLES; DETECTION OF  
POTASSIUM ION

Tufts, B. J.

*Analytical Chemistry*, v. 31, pp. 242–243,  
February 1959

699. HIGH DUST RECOVERY RATE REPORTED  
AT ROCKLITE WITH MULTIPLE  
CYCLONES

*Pit and Quarry*, v. 51, p. 107, February 1959

700. CENTRIFUGAL SEPARATORS RECOVER  
DIAMOND DUST

*Steel*, v. 144, p. 70, March 9, 1959

701. REMOVING IMPURITIES IN SMOKE FROM  
INDUSTRIAL CHIMNEYS

Cellan-Jones, G.

*Gas World*, v. 149, no. 3893, pp. 613–614,  
March 28, 1959

A device is proposed which removes incombustible or uncombusted gases or deleterious solid or gaseous contents of smoke, such as carbon grit, sulphurous fumes, etc., and prevents them from issuing to the atmosphere, by spraying liquid in the form of mist into smoke as it issues from the chimney stack. A collection device in the form of an annular channel collects the water after it passes through smoke. A stream guide conducts smoke through water mist. This device accommodates the demands of the Clean Air Act. (*EI*, 1959)

702. LUFTFILTER ZUR ABSCHEIDUNG  
RADIOAKTIVER STAEUBE (AIR FILTERS  
FOR SEPARATION OF RADIOACTIVE  
DUSTS)

Becker, F. H.

*Chemie-Ingenieur-Technik*, v. 31, no. 3,  
pp. 145–148, March 1959

Filter materials and constructions applicable to nuclear reactors and in isotope laboratories are suggested. (*EI*, 1959)

703. POLLEN REMOVAL BY AIR FILTERS

Silverman, L., Dennis, R.

*Air Conditioning, Heating, and Ventilating*,  
v. 56, no. 3, pp. 61–66, 128, March 1959

The efficiency and resistance characteristics for glass fiber and wire-screen-type viscous filters used in air conditioning systems, and methods of aerosol generation and sampling suitable for dispersing and measuring airborne pollen concentrations in test apparatus are presented. With good mineral fiber dispersion and lubrication,  $\frac{1}{2}$ -, 1- and 2-in. filters showed average count efficiencies of 50, 70, and 92%, respectively. (*EI*, 1959)

704. AEROSOLFILTRATION MIT MEMBRAN-  
FILTERN IM TEILCHENGROESSEN-  
BEREICH UNTERHALB 0.1 MIKRON  
(AEROSOL FILTRATION WITH  
MEMBRANES FOR PARTICLE SIZES  
BELOW 0.1 MICRONS)  
Walkenhorst, W.  
*Staub*, v. 19, no. 3,  
pp. 69-72, March 1959

Tests were carried out with two West German membrane filters of coarse, or intermediate permeability. The results indicate continuous decrease in filter capacity with particle size (100% capacity with 0.1  $\mu$  particles), in contradiction to results reported by J. J. Fitzgerald and C. G. Detwiler. No "minimum of precipitation" was found for American-made membrane filters. (*EI*, 1959)

705. SELECTIVE PARTICLE ACCELERATION  
*Gas Journal*, v. 298, no. 4998, p. 312, April 29, 1959

An apparatus manufactured by Steels Engineering Installations, Ltd., uses the acceleration principle, which is carried out in one operation within the collector elements. Air is accelerated as it passes through the operating zone on its helical path. The collector comprises standard elements housed within a fabricated steel body and dust collecting hopper. Features are the collection of smaller particle sizes, the elimination of collector wear, and a low pressure drop and power consumption. (*EI*, 1959)

706. EIN ELEKTROFILTER ZUR ABSCHEIDUNG  
RADIOAKTIVER AEROSOLE (AN  
ELECTRONIC FILTER FOR PRECIPITATION  
OF RADIOACTIVE AEROSOLS)  
Riezler, W., Kern, W.  
*Nukleonik*, v. 1, no. 5, pp. 191-195, April 1959

A description is given of a precipitation filter for radioactive fission products having a cross section of 80 by 80 cm<sup>2</sup>, air throughput of 1700 m<sup>3</sup>/hr, and degree of precipitation of 70-90%. (*EI*, 1959)

707. CURTAIN-TYPE GRIT AND DUST  
ARRESTOR  
*Engineering and Boiler House Review*,  
v. 74, no. 4, pp. 109-110, April 1959

Construction details of "DEP" dust-control equipment manufactured by W. G. Allen & Sons, Great Britain, are delineated. This filtering medium comprises a number of grids, placed one behind another in staggered forma-

tion to form a single curtain, or banks of curtains. The principle of operation is defined. A further development is presented of the "ALLEN-DEP" curtain with electrostatic precipitation, so arranged that the rear curtain constitutes the precipitation or positive electrode, while the first one acts as a prefilter to the high-tension negative electrode. (*EI*, 1959)

708. COLLECTION REPORT ON NEW TYPE  
WET SCRUBBER  
Freidrich, H. E.  
*Air Engineering*, v. 1, no. 2, pp. 23-25, 51,  
May 1959

The construction and mechanical features of a hydraulic scrubber using a finely atomized spray system for particle conditioning, and initial contaminant separation by cyclonic action are explained. This scrubber has a high removal efficiency for gas volumes of 2000 to 65,000 ft<sup>3</sup>/min, using water quantities of 3½ gal/min per 1000 ft<sup>3</sup>/min and air and hydraulic horsepower of 1.3 to 2.5 per 100 ft<sup>3</sup>/min. Its application to galvanizing, lime hydrate production and coke breeze drying is described. (*EI*, 1959)

709. VERSATILE HIGH FLOWRATE TAPE  
SAMPLER  
Nader, J. S.  
*Air Pollution Control Association, Journal of the*,  
v. 9, no. 1, pp. 59-61, May 1959

The development and operation of a sampler for atmospheric particulate matter are discussed. The total air flow-rate through the filter area is adjustable over a wide range. The filter medium is WS microweb membrane in tape form. A number of nondestructive and destructive analyses may be performed on matter as it exists on the tape. The instrument is designed as a basic unit of the instrument system using several accessory unit analyzers. (*EI*, 1959)

710. BETTER DUST COLLECTION WITH A  
PACKAGED UNIT  
Cressman, C. S., White, J. C.  
*Coal Age*, v. 64, no. 6, pp. 92-95, June 1959

A report is given of the wet-type dust collector installation at the coal preparation plant of Mine No. 31, Bethlehem Mines Corp., Nanty Glo, Pa. This wet-type dust collector consists of mixer, eliminator and suction-fan sections; dust particles enter mixer section under suction from fan, pass through water saturated air produced by spray nozzles and then strike and pass through a water-film covered impingement element. (*EI*, 1959)

711. RECOVERY OF FUME FROM METALLURGICAL GASES AT TRAIL, B. C.  
Hargrave, J. H. D., Snowball, A. F.  
*Canadian Mining and Metallurgical Bulletin*, v. 52, no. 566, pp. 366–370, June 1959

Gases from Cominco's metallurgical operations approximating 900,000 ft<sup>3</sup>/min are treated by baghouses, electrostatic precipitators, cyclones, or wet scrubbers. Recovery of over 99% of fumes and dust is achieved. The cooling of gases for baghouse recovery and conditioning for electrostatic precipitation are described. Costs of installations on the basis of units of 1000 ft<sup>3</sup> of gas are tabulated. (EI, 1959)

712. APPLICATION OF MECHANICAL COLLECTOR IN COMBINATION WITH ELECTROSTATIC PRECIPITATOR  
Walker, A. B., Phyl, J.  
*Blast Furnace and Steel Plant*, v. 47, no. 6, pp. 622–624, June 1959

Technical arguments are presented in favor of and against the use of combination collectors. New findings of model studies on combination unit collectors, four factors which should govern selection of a precipitator, and Research-Cottrell's approach to a combination collector are included. (EI, 1959)

713. HOW TO FIND FINE PARTICLES  
Alexander, N. E.  
*Air Engineering*, v. 1, no. 4, pp. 43–46, 48, July 1959

The design, operation, and calibration of an optoelectronic instrument called aerosoloscope are explained. The instrument is designed to automatically count and measure airborne aerosol particles, in range from about 1 to 64  $\mu$ . It is efficient, is easy to operate and maintain, and has high stability and consistency. The development of a membrane filter to aid in microscopic examination, counting and measurement of air pollutant particles is also described. (EI, 1959)

714. DUST PROPERTIES AND DUST COLLECTION  
Gutterman, B.  
*American Society of Civil Engineers, Proceedings of the*, v. 85 [SA 4, paper 2088], pp. 25–69, July 1959

Analytical methods to permit the calculation of reentrainment and backmixing characteristics of dust suspensions and dust layers are based on the physical prop-

erties of dust and of fluid conveying or acting on dust. In case of a diffusion ratio close to unity, backmixing by turbulent diffusion can be expected. Concentration gradient can be predicted with fair accuracy if velocity profile and one point of concentration are known. (EI, 1959)

715. LOW COST CUPOLA DUST COLLECTOR  
Silverman, L., Billings, C. E.  
*Air Engineering*, v. 1, no. 4, pp. 40–42, July 1959; no. 5, pp. 43–45, August 1959; no. 6, pp. 44–47, September 1959; no. 7, pp. 44–46, 50, October 1959

A study was undertaken to provide a collector with high efficiency, low cost, and minimum space requirements for fine ( $0.1 \mu$ ) fumes contained in high temperature gases (1000°F). The following subjects were covered: fundamentals of agglomeration (July); rotary screw agglomerator performance and high temperature filtration (August); pilot plants (September); and shock wave cleaning technique for dry filters (October). Study results are applicable to effluents from gas turbines, air or gas cooled nuclear reactors, and incinerators. (EI, 1959)

716. EFFECT OF PROBE SHAPE ON ACCURACY OF SAMPLING FLUE GASES FOR DUST CONTENT  
Whiteley, A. B., Reed, L. E.  
*Institute of Fuel, Journal of the*, v. 32, no. 222, pp. 316–320, July 1959

Tests were carried out in order to develop probes for dust sampling that would be more robust and compact than those normally employed. A nonstandard probe was tested over a wide range of sampling velocities, using relatively coarse test dust. Its performance was compared with that of a standard probe under comparable conditions. The weight of dust collected by probes was almost independent of sampling rate. (EI, 1959)

717. STAUBGEHALTSMESSUNG IN INDUSTRIEGASEN UND ATEMLUFT, STAUBNIEDERSCHLAGSMESSUNGEN IM GELAENDE (MEASURING DUST CONTENT OF INDUSTRIAL GASES AND IN AIR, ALSO THE AMOUNT OF DUST CARRIED AFIELD)  
Guthmann, K.  
*Stahl und Eisen*, v. 79, no. 16, pp. 1129–1141, August 6, 1959

Methods and apparatus used in dust control are reviewed. Included is a critique of different methods. 43 references. (EI, 1959)

**718. DUST COLLECTION PLANT HAS UNIQUE FEATURES**

*Gas World*, v. 150, no. 3915, p. 110,  
August 29, 1959

The spa collector, which belongs to a multi-cellular group of dry centrifugals and uses the unique principle of selective particles acceleration, has the following advantages: smaller particles are collected; collector wear is eliminated; and pressure drop, power consumption, and erosion are low. The device comprises standard elements housed within a fabricated steel body with a dust collecting hopper. The number of elements is varied to meet requirements of each application. Entrained particle separation is carried out in one operation within the elements. Efficiency is discussed. (*EI*, 1960)

**719. CARE AND HANDLING OF INSTRUMENTS FOR KONIMETRY**

Andrew, O. E.  
*Canadian Mining Journal*, v. 80, no. 8, pp. 66–68,  
August 1959

The Konimeter is a portable dust-sampling instrument that can be used in almost any situation in mine or plant. The construction specifications that affect sampling consistency and efficiency are given. (*EI*, 1959)

**720. TEST METHOD FOR EVALUATING MIST AND DUST COLLECTION EQUIPMENT**

Ranz, W. E., Katz, E. J.  
August 1959  
Pennsylvania State University, College of  
Engineering and Architecture, University Park  
Research Bulletin 73

A procedure is given for measuring impaction efficiencies and performance characteristics of collectors. A sampling system was developed for measuring the concentration of various sizes of mist entering and leaving collector. This report also describes an experimental test stand developed for evaluation of performance of collection equipment. (*EI*, 1959)

**721. EXPERIMENTS WITH MINIATURE CYCLONES**

Alden, J. L.  
*Air Conditioning, Heating, and Ventilating*,  
v. 56, no. 9, pp. 64–68, September 1959

An examination is made of cone proportions, cylindrical body length, inlet area, and air outlet area to determine their influence on the pressure drop and capacities of

small cyclones. It is concluded that cone slenderness or over-all length distribution between cone and body is of minor importance. Test methods and results for industrial design purposes are given. (*EI*, 1959)

**722. PRECIPITATOR CUTS FLY ASH FROM POWER PLANT**

Gallaer, C. L.  
*Air Engineering*, v. 1, no. 6, pp. 32–34,  
September 1959

An electrostatic precipitator for fly ash collection from 690,000 lb of steam/hr has helped Pennsylvania Power Co., New Castle, Pa., to obtain greater steam output from the boiler by decreasing resistance to air flow through the system. An increased combustion rate is made possible by lower resistance of electrostatic collector. The advantages obtained are nearly invisible emission and reduced draft fan maintenance. (*EI*, 1959)

**723. HOW TO TAKE CARE OF DUST COLLECTORS**

Johns, L. M.  
*Mill and Factory*, v. 65, no. 3, pp. 115–117,  
September 1959

Inspection check lists are suggested for intermittent cloth type, continuous operating reverse air cleaning cloth type, centrifugal tower set type, concurrent wet type, and sludge settling tanks. (*EI*, 1959)

**724. THEORETICAL ANALYSIS OF EFFECTS OF ELECTRIC FIELD ON CHARGING OF FINE PARTICLES**

Murphy, A. T., Adler, F. T., Penney, G. W.  
*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 79, no. 44, paper 59–102,  
pp. 318–326, September, 1959

A theory regarding the effect of the external electric field on random-motion particle-charging process in the charging chamber of an electrostatic precipitator is proposed. This field is shown to have two main effects: the effect on the energy of ions traveling toward particles, and effect on density distribution of ions in the neighborhood of particles. 16 references. (*EI*, 1959)

**725. FIELD-STRENGTH MEASUREMENTS IN PARALLEL-PLATE PRECIPITATORS**

Lagarias, J. S.  
*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 79, no. 44, paper 59–206,  
pp. 427–433, September 1959

Studies were made with experimental precipitator assemblies, using the dropping sphere technique to obtain field strength patterns in parallel-plate configurations and to determine effect of dust loading on field strength. (EI, 1959)

726. DEVELOPMENT OF NEW HORIZONTAL-FLOW, PLATE-TYPE PRECIPITATOR FOR BLAST FURNACE GAS CLEANING

Berg, B. R.

*Iron and Steel Engineer*, v. 36, no. 10, pp. 93–100; (discussion) pp. 100–101, October 1959

A new method of introducing and distributing flushing water eliminates former size and height restrictions of the precipitator. High collecting efficiencies are obtained with high inlet dust concentrations. The relation between precipitator size, gas volume, and collecting efficiency is shown. Testing of a pilot precipitator, experience with the first two full-scale units, and development of final design are reported. The adaptation of horizontal flow precipitators for present and future needs is considered and the electrical equipment discussed. (EI, 1959)

727. BALANCED DESIGN IN ELECTROSTATIC PRECIPITATION

Chamberlain, R. L.

*Blast Furnace and Steel Plant*, v. 47, no. 10, pp. 1086–1089, October 1959

Factors to consider are the size and components of the precipitator, the choice of electrical equipment for specific gas cleaning problems, and the design of the collecting electrode plate and discharge electrode wire. Eleven criteria for evaluating the factors are given. (EI, 1959)

728. HOW TO DESIGN DUST CONTROL SYSTEMS

Vedder, W. O.

*Air Engineering*, v. 1, no. 7, pp. 24–27, 49, 51, October 1959

Factors governing the design, application, and operation of dust collection systems are discussed. Specifics include exhaust hoods, piping, collection mechanisms, and blower units. Recommended velocities for exhaust systems conveying dry dust are tabulated. (EI, 1960)

729. HOLMES-ROTHMULE MULTICELL CYCLONE DUST COLLECTORS

*The Engineer*, v. 208, p. 707, November 27, 1959

730. HOW TO EVALUATE VACUUM CLEANERS  
Kimball, R. C.  
*Plant Management and Engineering*, v. 20, pp. 44–46, November 1959

731. ELECTRIFIED FIBROUS AIR FILTERS  
Thomas, J. W., Woodfin, E. J.  
*AIEE, Transactions of the, Part II — Applications and Industry*, pp. 276–278, November 1959

732. INSTRUMENTS FOR STUDY OF ATMOSPHERIC POLLUTION  
American Society of Mechanical Engineers, Committee on Air Pollution Controls, New York, N. Y., 1959

An outline is presented of instruments (and manufacturers) for indicating and/or recording smoke density, particulate matter, gases, vapors, and liquids. Auxiliary devices for sampling air and gases, and meteorological equipment are included. (EI, 1959)

733. GRIT AND DUST SAMPLING EQUIPMENT  
*The Engineer*, v. 209, p. 108, January 15, 1960

734. TAKING THE DUST OUT OF DUSTBINS  
*Engineering*, v. 180, p. 93, January 15, 1960

735. DUST CONTROL IN MINES OF BRITISH COLUMBIA  
MacLeod, D. A.  
*Canadian Mining and Metallurgical Bulletin*, v. 53, no. 573, pp. 40–43, January 1960  
(See also *Mining Journal*, v. 255, no. 6524, pp. 257–259, September 2, 1960)

Dust sampling and inspection are discussed, and dust control by means of underground ventilation and wetting broken rock is considered.

736. CHOOSING YOUR ELECTROSTATIC PRECIPITATOR  
Stastny, E. P.  
*Power*, v. 104, pp. 61–64, January 1960

737. HORIZONTAL FLAT-PLATE SAMPLE OF SOLID PARTICLES IN THE ATMOSPHERE  
Hage, K. D., Diehl, C. H. H., Dudley, M. G.  
*AMA Archives of Industrial Health*, v. 21, pp. 124–131, February 1960

738. CONTROLLED AIR SYSTEMS WITH  
ENCLOSED HOODS  
Schunig, G. F.  
*Tappi*, v. 43, supplement 202A-6A, February 1960
739. TWO LEHIGH VALLEY CEMENT PLANTS  
LICK AIR-POLLUTION PROBLEM; GLASS  
BAGS, SONIC CLEANING ACHIEVE  
DRAMATIC RESULTS  
*Rock Products*, v. 63, pp. 104-107, February 1960
740. SELF-CONTAINED DUST COLLECTOR  
*The Engineer*, v. 209, p. 480, March 18, 1960
741. CURRENT APPLICATIONS OF THE  
REVERSE-JET FILTER PRINCIPLE  
Caplan, K. J.  
*AMA Archives of Industrial Health*, v. 21,  
pp. 200-208, March 1960
742. A MASS LOADING AND RADIOACTIVITY  
ANALYZER FOR ATMOSPHERIC  
PARTICULATES  
Nader, J. S., Allen, D. R.  
*American Industrial Hygiene Association Journal*,  
v. 4, pp. 300-307, 1960  
  
The thickness of atmospheric deposits collected on tapes can be measured by a  $\beta$ -gage technique with  $C^{14}$  to obtain the atmospheric concentration of particulates. The  $\alpha$ - and  $\beta$ -activity of the deposits can give also the  $\mu\text{uc}/\text{m}^3$  in the air.
743. REZULTATY ISSLEDOVANII  
ESTESTVENNYKH AEROZOLEI NAD  
RAZLICHNYMI RAIONAMI SSSR (RESULTS  
OF A STUDY OF NATURAL AEROSOLS IN  
DIFFERENT REGIONS OF THE USSR)  
Laktionov, A. G.  
*Izvestiya Akademii Nauk SSSR, Seriya  
Geofizicheskaya*, v. 24, no. 4, pp. 566-574,  
April 1960  
  
A method of taking aerosol samples by means of an air-borne nephelometer is presented. Data are given on the concentration of large aerosol particles during different seasons in free atmosphere at altitudes of 100 and 1000 m. (EI, 1961)
744. TRIPLE FILTRATION ELIMINATES DUST;  
MICROSTAT VACUUM CLEANER  
*Product Engineering*, v. 31, p. 105, May 16, 1960
745. REVIEW OF DUST ASSESSMENT  
TECHNIQUES  
Ross, C. R.  
*Canadian Mining and Metallurgical Bulletin*,  
v. 53, pp. 419-423, June 1960
746. HOW TO SELECT DUCTWORK, HOODS  
AND DUST COLLECTORS  
Soderberg, H. E.  
*Engineering and Mining Journal*, v. 161,  
pp. 195-199, June 1960
747. REPORT ON A PUMP-OPERATED AIR  
ASPIRATOR  
Nunlist, A.  
*Journal of Scientific Instruments*, v. 37, p. 221,  
June 1960
748. SRAVNITELNYE IZMERENIYA  
KONTSENTRATSII I FUNKTSII RASPREDEL  
ENIYA CHASTITS VODNYKH AEROZOLEI  
(COMPARATIVE CONCENTRATION  
MEASUREMENTS AND DISTRIBUTION  
FUNCTIONS OF AQUEOUS AEROSOL  
PARTICLES)  
Laktionov, A. G., Levin, L. M.  
*Izvestiya Akademii Nauk SSSR, Seriya  
Geofizicheskaya*, v. 24, no. 7, pp. 1056-1058,  
July 1960  
  
A method of measurement is presented and equipment for concentration measurement is described. (EI, 1961)
749. STOERUNG DER SEDIMENTATIONS-  
ANALYSE DURCH DAS UMSTROEMEN  
VON KOERPERN IM SEDIMENTATIONS-  
GEFAESS (INTRODUCTION OF ERROR  
IN SEDIMENTATION ANALYSIS  
THROUGH THE CIRCULATION OF  
BODIES IN THE SEDIMENTATION  
CONTAINER)  
Kast, W.  
*Staub*, v. 20, no. 7, pp. 205-211,  
July 1960  
  
In particle size determination of dust by sedimentation analysis, error is introduced by density changes in flow, caused by entry of body into suspension. Flow error and its relationship to geometric dimensions of measuring apparatus are examined for analyses with Andreasen pipette and Bachmann balance. For the pipette simple cor-

rection is suggested. Mathematical correction and measures for reducing or compensating flow error for the sedimentation balance are presented. (*EI*, 1961)

750. SIMPLE CHAIN SCRAPER FOR DRY DUST COLLECTORS

Stewart, A. J.

*Chemical Engineering*, v. 67, p. 154,  
July 11, 1960

751. DUST COLLECTOR REVIEW

Stephan, D. G.

*Modern Castings*, v. 38, no. 1, pp. 75-83,  
July 1960

Selection criteria are given for dust and mist collection equipment. Six general categories are discussed in terms of principles of operation, general descriptions, advantages, and limitations. A table of approximate collector characteristics lists cost, smallest particle size collected, pressure drop, and power requirement for each collector type. (*EI*, 1960)

752. NEUE METHODE DER STAUBMESSUNG MITTELS KLEINIONENANLAGERUNG (NEW METHOD OF DUST MEASUREMENT BY IONIZATION)

Hasenclever, D.

*Staub*, v. 20, no. 7, pp. 212-218,  
July 1960

The description and experimental results of a new principle of measurement for continuous recording of dust content of gases are given. Dust laden air is partially ionized during passage through a cylindrical ionization chamber. The reference ionization current  $I_0$  for dust free air, and reduced ionization current  $I_{dust}$  for dust laden air, enable determination of dust concentration, which is proportional to the logarithm of  $I_0/I_{dust}$  ratio. (*EI*, 1961)

753. ELECTROSTATIC DUST MONITOR

Grindell, D. H.

*Institution of Electrical Engineers, Proceedings of the, Part A—Power Engineering*, v. 107, pp. 353-362, August 1960; (discussion) v. 107, pp. 362-364, August 1960; (reply) v. 107, pp. 364-365, August 1960; (discussion) v. 109, pp. 124-125, February 1962; (reply) v. 109, p. 125, February 1962

754. STAUBABSCHIEDUNG DURCH DRUCK- UND THERMODIFFUSION (SEPARATION OF DUST BY PRESSURE AND THERMODIFFUSION)

Stetter, G.

*Staub*, v. 20, no. 8, pp. 244-252, August 1960

The diffusion process in gases can give rise to motion of suspended dust particles. Fundamental considerations of thermo-diffusion show that precipitation can be achieved by passing gas through a temperature field formed between hot and cold plates. With laminar flow and suitable dimensions, precipitation is quantitative and fractionation is possible. Dust movement which occurs as a result of vaporization and condensation processes is discussed. (*EI*, 1961)

755. STAUBMESSGERÄEDE MIT MASSEN- PROPORTIONALER ANZEIGE ODER REGISTRIERUNG (DUST-MEASUREMENT TOOLS WITH MASS-PROPORTIONAL RECORDING OR REGISTRATION)

Gast, T.

*Staub*, v. 20, no. 8, pp. 266-272, August 1960

Dust concentration is described and fundamentals of the gravimetric recording method are presented. The method of operation and the construction of an electronic balance for dust measurements are described, and utility and limitations discussed. A wide range of dust concentrations and multiplicity of environmental conditions have led to three variations of the dust balance with respect to sensitivity, time of measurement, and construction. (*EI*, 1961)

756. UEBERBLICK UEBER PROBLEME DES STAUBNIEDERSCHLAGSMESSUNG (SURVEY OF PROBLEMS OF MEASURING DUST PRECIPITATION)

Schwarz, K.

*Staub*, v. 20, no. 8, pp. 275-278, August 1960

The first requirement arising from a "Clean Air Law" is the establishment of maximum permissible values for air pollution. A prerequisite is the availability of proved dust measurement methods. In addition to the measurement of dust concentration in air, it is currently simpler to determine dust deposition. Requirements for such methods of measurement are described, including aspects of funnel method and adhesion foil method. (*EI*, 1961)

757. VERFAHREN ZUR MESSUNG RADIOKTIVER STAEBE IN ARBEITSRAEUMEN (PROCEDURES FOR MEASURING RADIOACTIVE DUSTS IN WORK AREAS)  
Hasenlever, D.

*Staub*, v. 20, no. 8, pp. 314–319, August 1960

Various types of apparatus are described. For measurement of activity on high grade filters, proportional counters are particularly suited. Accuracy of determination depends on gas volume determination, and particularly on accuracy of determination of filter efficiency with respect to aerosol, and of efficiency of determination of counting tube apparatus with respect to measured radiation. (*EI*, 1961)

758. INSTEAD OF BLOWING IT OFF, USE A VACUUM  
*Industrial Finishing*, v. 36, pp. 75–76, September 1960

759. ASH REMOVAL SYSTEM FOR SMALL COAL-BURNING PLANTS  
*Air Conditioning, Heating, and Ventilating*, v. 57, p. 110, October 1960

760. RESERVE IONIZATION PHENOMENA IN ELECTROSTATIC PRECIPITATOR  
Masuda, S.  
*Institute of Electrical Engineers of Japan, Journal of the*, v. 80, no. 865, pp. 1482–1489, October 1960 (in Japanese with English summary)

A study is made using a needle-plate electrode and a dust sample from a cement rotary kiln. The mechanism of reverse ionization leading to a complete breakdown is discussed. (*EI*, 1961)

761. ZUR ROUTINEMESSUNG DER KORN-GROESSENVERTEILUNG VON FEINSTAUB-NIEDERSCHLAEGEN IM THERMAL-PRAEZIPITATOR MIT HILFE DES ELEKTRONENMIKROSKOPES (THE ROUTINE MEASUREMENT OF THE PARTICLE SIZE DISTRIBUTION OF FINE DUST DEPOSITS IN THE THERMAL PRECIPITATOR USING THE ELECTRON-MICROSCOPE)  
Westerboer, I.

*Staub*, v. 20, no. 10, pp. 361–364, October 1960

Difficulty in electron microscope particle size analysis of thermal precipitator samples lies in marked change in particle size distribution occurring at right angles to strip on object carrier. This effect is considered in two methods of analysis: in the first, all particles at right angles to deposition strip are collected; in the second, particle size is obtained from one electron microscope photograph. (*EI*, 1961)

762. ERFAHRUNGEN BEI DER STAUBMESSUNG MITTELS MEMBRANFILTER IN DER TSCHECHE-SLOWAKEI (MEMBRANE [MILLIPORE] FILTERS USED IN CZECHOSLOVAKIA FOR DUST MEASUREMENT)  
Simecek, J., Oppl, L.

*Staub*, v. 20, no. 10, pp. 366–368, October 1960

The advantage of this system is that dust is collected with efficiency of almost 100% in its original state. In addition to the method of gravimetric dust concentration determination, the possibility of evaluating particle concentration with the aid of a membrane filter is discussed. A comparison of methods shows the relationship between gravimetric concentration data and particle concentration. (*EI*, 1961)

763. ASH REMOVAL SYSTEM IN INSTITUTION ELIMINATES TIME-CONSUMING OPERATIONS  
*Heating, Piping, and Air Conditioning*, v. 32, p. 43, November 1960

764. ELECTRO PRECIPITATORS: PRACTICAL DESIGN ASPECTS  
Sayer, J. E.  
*Institute of Fuel, Journal of the*, v. 33, no. 238, pp. 542–550, November 1960

Various design factors and operating conditions which have major influence on performance of electro-precipitator installation are discussed. The desirability of pretreatment of dusty gas stream to maintain controlled conditions of temperature and humidity in certain cases is cited. Design of precipitator installations for power stations and steelworks is considered. A description of typical installations is given. (*EI*, 1961)

765. AIR POLLUTION REVIEW 1958–59  
Faith, W. L.  
*Industrial and Engineering Chemistry*, v. 52, no. 11, pp. 967–971, November 1960

An annotated literature survey is presented which is classified under the following general aspects: urban air pollution; meteorological problems; effects of air pollution; methods of abatement; dust and fume separation; smoke and fly ash abatement; and special problems, including automobile exhaust and radioactivity. 226 references. (*EI*, 1961)

766. EICHVERFAHREN ZUR MESSUNG DER RADIOAKTIVEN AEROSOLKONZENTRATION NACH DER FILTERMETHODE (MEASUREMENT OF RADIOACTIVE AEROSOL CONCENTRATIONS PERFORMED BY ENRICHING FIBROUS FILTERS)

Weber, K. H., Wisch, W.

*Staub*, v. 20, no. 11, pp. 393-398, November 1960

Calibrations are achieved by surface preparations of known activity and filters with similar absorption characteristics. The evaluation requires consideration of differences in self absorption caused by exponential dust deposition. Correction factors are calculated as a function of energy, collection efficiency, and surface density of filter. (*EI*, 1961)

767. KLASIFIKATION DER STAUBMESS-METHODEN UNTER ANWENDUNG DER MEMBRANFILTER (CLASSIFICATION OF METHODS OF MEASURING DUST PARTICLES USING A MEMBRANE FILTER)

Spurny, K.

*Staub*, v. 29, no. 11, pp. 398-400, November 1960

On the combined basis of experience over seven years, and with the assistance of collected literature data, a classification method for determination of dust and aerosol concentrations by use of membrane filters is suggested. The significance of individual group measurement methods is shown. (*EI*, 1961)

768. ZUR HERSTELLUNG RADIOAKTIV MARKIERTER MEMBRANFILTER UND IHRE ANWENDUNG IN DER STAUB-MESSTECHNIK (PRODUCTION AND APPLICATION OF RADIOACTIVE MEMBRANE FILTERS TO DUST MEASUREMENT TECHNIQUES)

Spurny, K., Kubie, G.

*Staub*, v. 20, no. 11, pp. 400-402, November 1960

A method is described for the production of filters, containing radioactive Ni, having activity of  $0.05 \mu\text{c}/\text{cm}^2$ , employed for separation of aerosols where quantity of collected material is determined by absorption of  $\beta$  radiation. The construction of an automatic measuring apparatus for rapid determination of aerosol concentrations is discussed. (*EI*, 1961)

769. ANWENDUNG DER ABSORPTION VON RUECKSTOSSTRAHLEN BEI DER MESSUNG ABGESCHIEDENER AEROSOLPROBEN (THE USE OF ABSORPTION OF RECOIL ATOMS TO MEASURE SEPARATE AEROSOL SAMPLES)

Jech, C.

*Staub*, v. 20, no. 11, pp. 403-404, November 1960

An experimental study of absorption of recoil atoms in aerosol layer deposited on membrane filter is discussed. The absorption depends on the diameter of particles in addition to total quantity deposited. This relationship is expressed by a simple mathematical formulation. Possible application to the technology of dust measurement is suggested. (*EI*, 1961)

770. PARACLONE DUST COLLECTOR

*Colliery Guardian*, v. 201, no. 5200, pp. 713-716, December 15, 1960

Paraclone can be readily and conveniently installed in flue gas ducting since it occupies a minimum of space. It consists basically of a battery of cyclone cells, each cell being aerodynamically designed and made of cast iron to precision limits. There is complete standardization and uniformity in production. The cells, being shell molded, are also highly resistant to abrasion, erosion, and corrosion. (*EI*, 1961)

771. EFFICIENCY OF FIBROUS AEROSOL FILTERS; DEPOSITION BY DIFFUSION OF PARTICLES OF A FINITE DIAMETER

Pasceri, R. E.

*Canadian Journal of Chemical Engineering*, v. 38, pp. 212-213, December 1960

772. REVIEW OF DUST COLLECTION EQUIPMENT

Stephan, D. G.

*Safety Maintenance and Production*, v. 120, pp. 32-36, December 1960; v. 121, pp. 42-47, January 1961

773. QUELQUES DIFFICULTÉS DE LA PURIFICATION ÉLECTRIQUE DES GAZ PROGRÈS RÉCENTS DANS LA CONNAISSANCE THÉORIQUE DE LA CONTRE-ÉMISSION (DIFFICULTIES IN ELECTRIC PURIFICATION OF GAS; RECENT DEVELOPMENT IN THEORETICAL KNOWLEDGE OF COUNTER-EMISSION)  
Pauthenier, M.  
*Société Française des Electriciens, Bulletin de la, Serie 8, v. 1, no. 12, pp. 830–832,*  
December 1960

Problems concerning reduced efficiency of electric precipitators caused by the formation of a bi-ionized field as a result of the presence of insulating gases in fumes are discussed. (*EI*, 1961)

774. CERAMIC FIBERS FOR FILTERING DUST FROM HOT GASES  
Kane, L. J., Chidester, G. E., Shale, C. C.  
1960  
U. S. Department of the Interior,  
Bureau of Mines, Washington, D. C.  
Report of Investigations 5672

Aluminum silicate fiber is suitable for filtering dust from gases at 1800°F. Effects of bulk density of filter, rate of gas flow, concentration of dust in filter, fiber diameter, depth of filter, and concentration of dust in feed gas on removal efficiency, pressure drop, and capacity of filter to hold dust are considered. The efficiency of high-density filters increases with concentration of dust in filter. (*EI*, 1960)

775. SILICON RECTIFIER OFFERS SAVINGS  
Stone, G. A.  
*Electrical World, v. 155, no. 4, pp. 54–55,*  
January 23, 1961

Advantages of using silicon rectifiers for dc conversion in smoke-stack electrostatic precipitation are presented. The replacement of other rectifiers is shown to be easy. (*EI*, 1961)

776. SIRENA DLYA AKUSTICHESKOI KOAGULYATSII AEROZOLEI (SIREN FOR ACOUSTIC COAGULATION OF AEROSOLS)  
Tsedin, S. A., Tsetlin, V. M.  
*Akusticheskii Zhurnal, v. 7, no. 1, pp. 79–86,*  
January 1961

Design data and gas dynamic and acoustic characteristics are given of a siren constructed and tested at the Institute of Nonferrous Metals. The applicability of siren to industrial dust collection is discussed. (*EI*, 1961)

777. BULK HANDLING OF ROCK DUST [ABSTRACT]  
Hanson, V. D.  
*Coal Age, v. 66, pp. 106–107, January 1961*
778. SELF-DUMPING HOPPERS FOR DUST DISPOSAL  
*Mill and Factory, v. 68, pp. 22+, February 1961*

779. WHAT YOU SHOULD KNOW ABOUT ELECTRICAL REQUIREMENTS OF ELECTROSTATIC PRECIPITATORS  
Nagel, L. L.  
*Air Engineering, v. 3, no. 3, pp. 31–33, 43,*  
March 1961; no. 5, pp. 30–41, May 1961

Factors are presented which include gas volume, corrosiveness, dew-point of gas, type of dust involved, location, and ambient temperature (March). The selection of switchgear, instrumentation of equipment, and economics of achieving desired efficiency are considered (May). (*EI*, 1961)

780. BETTER OPERATION OF DUST CONTROL SYSTEMS  
Caplan, K. J.  
*Archives of Environmental Health, v. 2, pp. 248–256, March 1961*

781. ELECTROSTATIC DUST COLLECTOR PLANT  
*Asbestos, v. 42, no. 9, pp. 16, 18, March 1961*

An electrostatic dust collector developed by Collectron Industries, Ltd. of Johannesburg is capable of handling virtually any kind of dust. The unit employs a fan which draws dust-laden air through the filter and positively charged particles are caught by collecting electrodes. The unit is said to handle particles of coal, magnetite, cement, soot, silicates, and fibrous materials. (*EI*, 1961)

782. PUT ALL YOUR DUST IN ONE BASKET  
*Mill and Factory, v. 68, pp. 112–113,*  
March 1961

783. DUST CONTROL AT GOVERNMENT METALLURGICAL LABORATORY

Benham, M. G.

*Mine Ventilation Society of South Africa, Journal of the*, v. 14, no. 3, pp. 42-45, March 1961

A laboratory at Salisbury, South Rhodesia uses air suction to draw off dust while the sample is being removed and the apparatus cleaned. An automatic valve incorporated in the exhaust system serving the pulverizers eliminates the human element in the operation of the machine. (*EI*, 1961)

784. SIZE AND SPACE NEEDS OF ELECTROSTATIC PRECIPITATORS

Brown, R. L.

*Air Engineering*, v. 3, no. 4, pp. 29-30, 49, April 1961

Factors which should be considered when contemplating installation of a precipitator for air cleaning, product recovery, or both, include pressure, temperature, dust density, dust removal system, dust storage, duct arrangement, insulation, and space limitations. The requirements of pyramidal hoppers, bunker hoppers, and drag scraper mechanisms for dry dust removal are discussed. (*EI*, 1961)

785. PNEUMATIC MATERIAL HANDLING SYSTEM SOLVES DIFFICULT FLY ASH DISPOSAL PROBLEM

James, R. G.

*Combustion*, v. 32, pp. 51-52, April 1961

786. ELECTRONIC SYSTEMS PURIFY AIR FOR METALWORKING PLANTS

*Steel*, v. 148, no. 17, pp. 152-153, April 24, 1961

Clean air for metalworking plants and protection of costly electrical equipment can be obtained with minimum maintenance and operating costs from electronic air filter systems. Examples of applications and a description of the U.S. Bureau of Standards' dust spot test to check efficiency of filters are given. (*EI*, 1961)

787. DUST COLLECTION METHODS FOR STEAM POWER PLANTS

Gould, G.

*Air Engineering*, v. 3, no. 4, pp. 37-38, April 1961; no. 5, pp. 36-37, May 1961

Centrifugal and electrostatic dust collectors, and density and dielectric strength of dust particles are discussed (April). Specific data are given for flyash particle size and abrasiveness; the combination of mechanical and electrostatic dust collectors, with related cost factors, is considered (May). (*EI*, 1961)

788. MOVEMENT OF AIR IN ELECTRIC WIND OF CORONA DISCHARGE

Robinson, M.

*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 80, no. 54, paper 61-90, pp. 143-149, May 1961

The practicability of using electric wind as an air-moving mechanism is viewed. An analysis is given of an electrostatic blower which operates on the principle of directly converting electric energy into kinetic energy of moving gas stream. Areas of application are suggested. For gases, but not necessarily for liquids, the electrostatic blower is seriously handicapped by efficiency of electro-kinetic conversion of only about 1%. 20 references. (*EI*, 1961)

789. FOUR WAYS TO CONTROL DUST AT BAG FILLERS

Andresen, W. V.

*Air Engineering*, v. 3, no. 5, pp. 34-35, May 1961

Dust is controlled during bagging and weight adjustment operations employing auger, impeller, fluidized or belt-type packers by use of plain or slotted hood enclosures. (*EI*, 1961)

790. DUST CONTROL IN ASBESTOS OPERATIONS

Sinclair, W. E.

*Asbestos*, v. 42, no. 11, pp. 2, 4, 6, 8, 10, May 1961

Use of inertial separators in cyclones, filter bag classification, and electrical precipitation are discussed. The filter bag classification is most commonly used in asbestos milling. (*EI*, 1961)

791. SPECIFICATION AND SELECTION OF DUST AND FUME COLLECTION EQUIPMENT

Flodin, C. R.

*Consulting Engineer*, v. 16, no. 5, pp. 118-123, May 1961

Advantages, disadvantages, and limitations of classes of dust collection equipment suitable for heavy process industries are discussed. The determination of design data for existing plants, new plants, or new processes and applications is considered. The collection problem is analyzed and an economic evaluation is made. Details are given of collectors employed, heavy duty cyclones, fabric filters, scrubbers, electrical precipitators, and combinations. Factors to consider in evaluation and selection are discussed. (EI, 1961)

**792. INDUKTSIONNYI METOD IZMERENIYA ZARYADOV OTDELNYKH CHASTITS (INDUCTION METHOD OF MEASURING CHARGES OF SEPARATE PARTICLES)**

Krasnogorskaya, N. V., Sedunov, Yu. S.  
*Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya*, v. 24, no. 5, pp. 775–785,  
May 1961

The theory and results of testing the induction method of measuring charges of aerosols in free atmosphere and at the Earth's surface are discussed. Errors are evaluated and recommendations are made concerning the selection of optimum parameters of equipment used. (EI, 1961)

**793. DEVELOPMENT AND PRELIMINARY TESTING OF DEVICE FOR ELECTROSTATIC CLASSIFICATION OF SUBMICRON AIRBORNE PARTICLES**

Langer, G., Radnik, J. L.  
*Journal of Applied Physics*, v. 32, no. 5,  
pp. 955–957, May 1961

A practical apparatus is developed for electrostatic size classification of aerosol particles of 0.1 to a few microns in diameter. Charging rates several times above those predicted by conventional theory permitted good resolution. Various aerosols were examined and results of practical significance were obtained. With salt aerosols, strong, higher-order Tyndall spectra were observed from classified deposit. (EI, 1961)

**794. LA MESURE DES CONCENTRATIONS EN POUSSIÈRES DES GAZ A L'ENTRÉE DES CHEMINÉES DE LA CENTRALE THERMIQUE DE CREIL (MEASUREMENT OF DUST CONCENTRATIONS IN GAS AT THE ENTRANCE OF STACKS OF CREIL THERMAL POWER PLANT)**

Edouard, L.  
*Genie Civil*, v. 138, no. 12, pp. 270–276,  
June 15, 1961

The dust collecting facilities of a 500-Mw plant are described. Combined mechanical and electrostatic collectors are described. Control measurements of the proportion of dust, by weight and volume of the gas, before entering dust collectors and after leaving them, are discussed. The measuring apparatus is described and calculations are given. (EI, 1961)

**795. HOW DUST FILTER SELECTION DEPENDS ON ELECTROSTATICS**

Frederick, E. R.  
*Chemical Engineering*, v. 68, no. 13, pp. 107–114,  
June 26, 1961

This study offers a guide to selecting a filter medium with electrostatic polarity and discharge rate that will give optimum capacity and efficiency. Tribo-electric series for the production fabrics are tabulated. The relation of fabric requirements to dust properties is shown, and fabric filtration performance data of five classes of dust are given. (EI, 1961)

**796. RATING OF DUST COLLECTORS ACCORDING TO DUST SETTLING VELOCITIES**

Hemeon, W. C. L., Haines, G. F., Jr.,  
Puntureri, S. D.  
*Air Pollution Control Association, Journal of the*,  
v. 11, no. 6, pp. 264–266, June 1961

The technique and apparatus for measuring inertial quality of dust to determine its collectability in various inertial type collectors are described. This method does not require calibration by other means such as microscopes. The apparatus is portable. (EI, 1961)

**797. ON IMPROVEMENT IN CLEANING EFFICIENCY OF ELECTROSTATIC PRECIPITATOR THROUGH ITS INLET-GAS HUMIDIFICATION**

Masuda, S.  
*Institute of Electrical Engineers of Japan, Journal of the*, v. 81, no. 873, pp. 968–974,  
June 1961 (in Japanese with English summary)

Field tests with a precipitator for a dry system cement rotary kiln exit gas are discussed. (EI, 1961)

**798. DUST SAMPLING INSTRUMENTS FOR METALLIFEROUS MINES**

Balashov, V., Brading, J. G., Rendall, R. E. G.  
*Mine Ventilation Society of South Africa, Journal of the*, v. 14, no. 6, pp. 98–100, June 1961

Several minor modifications have been made on commercially available dust sampling instruments such as the Hexlet gravimetric dust sampling instrument, in order to make them more suitable for use in metal mines. (*EI*, 1961)

799. PLASTICS VENT LINE

*Plastics World*, v. 19, p. 68, June 1961

800. STROMSTEUERnde TRANSDUKTOREN  
ZUR VERFAHRENSGERECHTEN SPANN-  
UNGSSTEUERUNG VON ELEKTROFILTERN  
(CURRENT-CONTROLLING MAGNETIC  
AMPLIFIERS FOR VOLTAGE CONTROL  
OF ELECTROSTATIC PRECIPITATORS)  
Goetz, G. F., Schwarz, E., Schlitt, R.  
*Siemens Zeitschrift*, v. 35, no. 6, pp. 478-482,  
June 1961

In large precipitating plants, these amplifiers are used to limit short-circuit current and permit control of electrode voltage, thus obviating the need for regulating transformers. (*EI*, 1961)

801. DETERMINATION AND SIMULATION OF  
EQUIVALENT CIRCUITS OF  
ELECTROSTATIC PRECIPITATORS

Thomas, J. B., Drenning, J. W., Williams, H. T.  
*AIEE, Transactions of the, Part I—*  
*Communication and Electronics*, v. 80, no. 55,  
paper 61-92, pp. 315-320, July 1961

A relatively simple equivalent circuit to describe accurately electric characteristics of commercial precipitator installations is examined. With appropriate scaling, the circuit may be simulated readily and inexpensively with conventional laboratory equipment. A flexible analog can be adjusted to simulate changes in precipitator operating conditions and equipment. (*EI*, 1961)

802. CHARGING OF NONSPHERICAL  
PARTICLES IN CORONA DISCHARGE

Smith, P. L., Penney, G. W.  
*AIEE, Transactions of the, Part I—*  
*Communication and Electronics*, v. 80, no. 55,  
paper 61-93, pp. 340-346, July 1961

An analytical study of charging of ellipsoidal particles and an experimental study of charging of particles of various other shapes are made. It is concluded that particle shape does not constitute an important design factor in electrostatic precipitation problems for particles usually encountered. (*EI*, 1961)

803. ELECTRICAL PRECIPITATION  
FUNDAMENTALS

White, H. J., Penney, G. W.  
July 1961

Pennsylvania State University, College of  
Engineering and Architecture, University Park  
EP P-39

Two lectures on electrical precipitation of particles are presented. The first deals with fundamentals, basic concepts, and physical and chemical characteristics of particulate matter or aerosoles; the second covers applications to air conditioning. (*EI*, 1961)

804. HIGH TEMPERATURE KNUDSEN  
EFFUSION SAMPLING SYSTEM: SIMPLE  
ELECTRON BEAM FURNACE

Panish, M. B., Reif, L.  
*Review of Scientific Instruments*, v. 32,  
pp. 831-832, July 1961

805. NEW TYPE PNEUMATIC CLASSIFIER  
ENDS DUST PROBLEMS

*Air Engineering*, v. 3, no. 8, pp. 19, 42,  
August 1961

A gravitational inertial-type dust classifier separates and recovers phosphate rock fines below 100 mesh. An air entrained feed enters the classifier downwardly and particles over 100 mesh are discharged from the bottom of the unit into a bucket elevator. Fines are drawn off through a side duct into a cyclone separator for recovery and discharge into the hopper. (*EI*, 1961)

806. EXHAUST HOODS FOR WOODWORKING  
EQUIPMENT [DETAIL SHEET]

*Air Conditioning, Heating, and Ventilating*,  
v. 58, pp. 87-88, August 1961

807. EVALUATION OF AERODYNAMIC PROBE

Humphrey, P. A.  
*Air Pollution Control Association, Journal of the*,  
v. 11, no. 8, pp. 362-363, 383, August 1961

An evaluation is given of a radio-controlled 10-ft wing span drone for taking air samples up to 1000 ft elevation. Aerometric information on temperature and humidity is telemetered to a ground unit. Sampling is accomplished by vacuum filters, bubblers, or pump. Radioactivity measurements also seem feasible. (*EI*, 1961)

808. DUST IN GAS STREAMS; SAMPLING TECHNIQUES AND ERRORS  
Doyle, A. W., Wiederhorn, N. M., Swan, A.  
*Petroleum Engineer, Management Edition*, v. 33, pp. 254-258+, August 1961
809. CLOTH DUST FILTERS; SELECTION, APPLICATION, MAINTENANCE  
Clement, R. L.  
*Plant Engineering*, v. 15, pp. 92-97, August 1961
810. AUTOMATIC CONTINUOUSLY RATED DUST COLLECTOR  
*The Engineer*, v. 212, p. 544, September 29, 1961
811. MATERIAL AND CONSTRUCTION FEATURES IN LABORATORY HOOD DESIGN  
Lanahan, T. B.  
*ASHRAE Journal*, v. 3, pp. 49-50, September 1961
812. IMPROVEMENT OF EFFICIENCY OF FIBROUS DIELECTRIC FILTERS BY APPLICATION OF EXTERNAL ELECTRIC FIELD  
Havlicek, V.  
*International Journal of Air and Water Pollution*, v. 4, no. 3-4, pp. 225-236, September 1961
- The dependence of particulate collection efficiency of a filter on aerosols is considered for different orientations of the electric field with respect to direction of air flow. The electric field exerts its greatest influence when parallel with flow. The method used in deriving equations for magnitude of forces exerted between aerosol particles and fibers of filter is explained. (*EI*, 1961)
813. DUST AND FUME CONTROL EQUIPMENT  
*The Manufacturing Chemist*, v. 32, pp. 402-403, September 1961
814. LOW VOLUME, HIGH VELOCITY SYSTEM CONTROLS DUST AT SOURCE  
Burgess, J. L.  
*Heating, Piping, and Air Conditioning*, v. 33, pp. 138-141, October 1961
815. DUST TROUBLE CAUSED BY STATIC ELECTRICITY  
Gaynes, N.  
*Industrial Finishing*, v. 37, pp. 113-114, October 1961
816. MOLDED RESIN DUCTS: CORROSION-FREE EXHAUST EQUIPMENT  
*Plastics World*, v. 19, p. 130, October 1961
817. HIGH EFFICIENCY AIR FILTERS  
*Engineering*, v. 192, p. 636, November 17, 1961
818. SOLENOID VALVES SIMPLIFY AUTOMATIC GAS SAMPLING  
Shea, G. F.  
*Chemical Engineering*, v. 68, pp. 132, 134, November 27, 1961
819. ACS SHELTER TO KEEP OUT AIRBORNE DANGERS  
*Chemical and Engineering News*, v. 39, pp. 70, 72, November 1961
820. WHAT TO CONSIDER IN DESIGNING MULTIPLE STREAM SAMPLING SYSTEMS  
Maley, L. E.  
*Control Engineering*, v. 8, pp. 91-96, November 1961
821. DUST EXPLOSIONS: PREVENT OR SUPPRESS EXPLOSION LOSSES IN BULK MATERIAL  
Olson, R. W.  
*Mechanical Engineering*, v. 83, pp. 59-61, November 1961
822. AIR FILTER FOAM PERMANENT, WASHABLE POLYURETHANE  
*Plastics World*, v. 19, p. 57, November 1961
823. AEC AIDS FIGHT ON INSTRUMENT DUST  
*Steel*, v. 149, p. 107, December 4, 1961
824. 17-IN-1 DUST COLLECTING SYSTEM TURNS WASTE INTO PROFIT IN WOODWORKING PLANT  
*Plant Engineering*, v. 15, pp. 106-107, December 1961

825. QUESTIONS AND ANSWERS ON FILTERS;  
INTERVIEW WITH L. L. DOLLINGER, JR.  
*Plant Engineering*, v. 15, pp. 117-119,  
December 1961

826. STUDY ON ELECTRO-PRECIPITATOR  
PERFORMANCE IN RELATION TO  
PARTICLE SIZE DISTRIBUTION, LEVEL  
OF COLLECTION EFFICIENCY AND  
POWER INPUT

Heinrich, D. O.

*Institution of Chemical Engineers, Transactions  
of the*, v. 39, no. 2, pp. 145-163, 1961

The influence of particle size distribution and of level of efficiency on apparent "effective" migration velocity in light of practical experience is discussed. A comparison of theoretical results with plant tests is made. A decrease in over-all effective migration velocity is shown when dust becomes finer. For practical purposes, particularly when comparing similar precipitators, only current input need be considered. (*EI*, 1961)

827. POROUS STAINLESS STEEL FILTERS  
FOR REMOVING DUST FROM HOT GASES  
Kane, L. J., Chidester, G. E., Takach, E.,  
Shale, C. C.  
1961  
U.S. Department of the Interior, Bureau  
of Mines, Washington, D.C.  
Report of Investigations 5842

Filters having the finest pores gave the greatest pressure drop and percentage of dust removal; however, their dust holding capacity was slightly lower. The effect is shown of operating variables (such as cumulative dust feed, resistance of clean filters, concentration of dust in gas, and temperature) on percentage of dust removed and pressure drop. The regeneration of filters by blow-back is also considered. (*EI*, 1961)

828. IZMERENIE VESOVOI KONTSENTRATSII  
PYLI V VOZDUKHE PRI POMOSHCHI  
β-IZLUCHENIYA (MEASURING GRAVI-  
METRIC CONCENTRATION OF DUST IN  
AIR USING β-RADIATION)  
Izmailov, G. A.  
*Zavodskaya Laboratoriya*, v. 27, no. 1, pp. 40-43,  
1961  
(English translation available in *Industrial  
Laboratory*, v. 27, no. 1, pp. 40-43, January 1961)

A device for continuous and automatic measurement of dust concentration in air is presented. Air is passed through a moving cloth filter tape which passes between  $\beta$ -radiation source and counter. A decrease in radiation owing to absorption by dust particles is recorded directly as mg/m<sup>3</sup>; field tests show that error does not exceed plus or minus 12%. (*EI*, 1961)

829. AIR SAMPLING SYSTEM GUIDES PLANT  
OPERATION AND DESIGN; INSTRUMENTS  
AND TEST STATIONS

Bovier, R. F.

*Electrical World*, v. 157, pp. 32-35,  
January 8, 1962

830. SUCTION DUCT FOR DUST REMOVAL  
*The Engineer*, v. 213, p. 283, February 9, 1962

831. OPERATING PRINCIPLES OF NON-  
IONIZING ELECTROSTATIC FILTERS  
Rivers, R. D.

*ASHRAE Journal*, v. 44, pp. 37-40,  
February 1962

832. BLACKLESS BANBURY DRIVE MOTORS;  
FIVE-SIDED FILTERS WITH AN ACRYLIC  
FIBER MEDIUM CLEAN PROCESS AIR  
Ralston, G. T.  
*Rubber Age*, v. 90, p. 777, February 1962

833. DUST CONTROL TO ORDER IN EIGHT-  
ROOM CLEAN AREA  
Borders, R. H.  
*Plant Engineering*, v. 16, pp. 122-124,  
March 1962

834. DUST COLLECTOR EASES CONDENSER  
TUBE CLEANING  
Headrick, B. C.  
*Electrical World*, v. 157, pp. 94-95, April 23, 1962

835. AEROSOL SAMPLER  
Evans, E. C., III, French, F. A.  
May 22, 1962  
U. S. Department of Commerce,  
Washington, D. C.  
U. S. Patent 3,035,445 (assigned to Dept. of the  
Navy)

A sampler for precipitating solid and liquid particles from an aerosol is designed which has a high impaction efficiency for smaller particles, provides a permanent record of the particle size as a function of time, and prevents the break-up of large particles into smaller ones. The precipitating head has a plurality of pins around the intake port, and a dc high voltage potential is applied to the pins to cause continuous corona discharge which ac-

celerates the aerosol and strips the particles therefrom. The particles are precipitated onto a moving film before the charged pins and intake port. (NSA, 1962, #19,027)

836. ENGINEERING EVALUATES DUST  
CONTROL

Wheeler, D. H.

*Rock Products*, v. 65, pp. 157-158+, May 1962

## GAS AND LIQUID—SAMPLING, HANDLING, ANALYSIS, AND TESTING

### 837. WEIGHING CAPILLARY FOR HANDLING LIQUIDS IN MICRO AND SEMIMICRO ANALYSIS

Ma, T. S., Eder, K. W.

*Chinese Chemical Society, Journal of the*, v. 15,  
pp. 112–120, 1947

A simple filling technique, applicable for 2- to 50-mg samples, is described.

### 838. MOLECULAR ANALYSIS BY THE RAMAN SPECTRUM METHOD

Sushchinskii, M. M.

*Trudy Fizicheskogo Instituta, Akademiya Nauk SSSR*, v. 5, pp. 185–260, 1950

The intensity of Raman lines is measured photometrically by simultaneous photography of the Raman spectrum and the fluorescent spectrum excited by the same source. Since the intensity, expressed in the same units as the fluorescent line intensity, is characteristic of the molecule studied, and practically proportional to concentration of this molecule, the method can be used for quantitative analysis.

### 839. ULTRAMICROMETHOD OF CHEMICAL ANALYSIS [PARTS I AND II]

Alimarin, I. P., Petrikova, M. N.

*Zhurnal Analitika Khimica*, v. 7,

pp. 341–348, 1952; v. 8, pp. 11–17, 1953

Part I. Basic characteristics, advantages, and disadvantages of ultramicromethods are reviewed. In this particular method, the minimum volume of analyzed solution is  $10^{-6}$  ml, the minimum weight of the analyzed substance is  $1\gamma$ , and the minimum weight of the desired element in a precipitate is  $10^{-8}\gamma$ . A special microscope having a movable stage and micromanipulators is used as well as special capillary apparatus. The reactions are carried out in a reaction chamber that contains a moist atmosphere to prevent evaporation. If the permissible error is 10%, and if the average molecular weight is 60, the necessary weight of substance is  $10^{-20}$  g. With a permissible error of 0.1%, the required weight of substance is  $10^{-16}$  g. A decrease in the mass and volume of the reactants results in a great relative increase of the surface per unit volume as compared to the macromethod. Greater adsorption on the

walls of the apparatus, causing greater losses of solution and greater extent of contamination, is the result of the relatively greater area of contact with the walls. Greater surface area also affects the rate of crystallization, the shape of the crystals, and the vaporization. Difficulties of the ultramicromethod, provided proper countermeasures are taken, are outweighed by the advantages of making accurate determinations with minute quantities of samples.

Part II. Separation and Detection of Elements by Electrolysis. This method can be successfully applied to volumes of the order of magnitude of  $1\lambda$  and to quantities of substance of the order  $10^{-6}$ – $10^{-8}$  g. Pt and Hg microelectrodes used in this method and the special apparatus necessary are described. Conditions under which the electrolyses were carried out and the results are tabulated.

### 840. WHERE ARE AREOMETRY AND TENSIOMETRY?

Pochan, A.

*Chimie Analytique*, v. 35, pp. 332–340, 1953

Areometric and tensiometric measurement methods are reviewed. Consideration of capillary suction is necessary in determining density. Automatic pressure measurement, temperature regulators, and remote control apparatus are discussed.

### 841. DETECTOR TUBES FOR OXIDES OF NITROGEN

Kramer, D. N., Goldstein, T. P.

January 29, 1954

Chemical and Radiological Labs., Army Chemical Center, Md.

Interim Report CRLR 315

AD-31, 057

### 842. MOLECULAR LIGHT SCATTERING FROM GASES

Gucker, F. T., Basu, S.

August 27, 1954

Indiana University, Chemistry Dept., Bloomington  
Final Report for January 1, 1951–December 31,  
1953, AF 19(122)400

AD-49, 855

A brief discussion is presented on Rayleigh's theory of light scattering by anisotropic molecules as formulated by Chandrasekhar in terms of Stokes parameters and scattering matrices. By the use of parallel illumination, relative scattering powers of different gases and depolarization factors were measured without the use of dubious convergence corrections. Determinations were made of the relative scattering power of seven gases and vapors compared with N. Rayleigh's theory accounted well for the relative scattering powers of O, CO<sub>2</sub>, propane, and butane, but for only about half of the observed scattering of methyl chloride, and a third of that of dimethyl ether. Data are presented on the determination of depolarization factors at scattering angles of 45, 90, and 135 deg. Attempts to measure the Stokes parameters of the scattered light for many orientations of the polarizer and analyzer led to anomalous results. With UV light, the depolarization coefficients of N at atmospheric pressure were only slightly higher than those obtained with white light under the same conditions. (ASTIA)

**843. DETERMINATION OF CARBON DIOXIDE IN THE ATMOSPHERE**

Uhlíř, P., Kešner, B.

Za Sotsial, Selskokhoz. Nauku, Series A, no. 1, pp. 9–20, 1954

(See also Referativnyi Zhurnal Khimiya, 1956, #54973)

A transportable apparatus for the determination of CO<sub>2</sub> in the air is described. The air is circulated through joined parallel tubes, a pump, and a washer containing Ba(OH)<sub>2</sub> solution. After the absorption of CO<sub>2</sub> (7–10 min of pumping operation) the solution in the washer is titrated with a 0.02N H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> solution or with HCl, using phenolphthalein as indicator. The Ba(OH)<sub>2</sub> solution is stored in a rubber balloon. The washers are filled with this solution without any contact with the air. The results are very precise.

**844. MESURE DE LA CONCENTRATION EN GAZ D'UNE ÉMULSION GAZLIQUIDE PAR ABSORPTION DE RAYONS GAMMA  
(MEASUREMENT OF GAS CONCENTRATION OF GAS-LIQUID EMULSION BY ABSORPTION OF GAMMA RAYS)**

Hours, R.

Houille Blanche, v. 10, no. B, pp. 636–645, September 1955

By measuring optical density for gamma rays, the average concentration of gas in a zone traversed by a beam of radiation can be obtained. The gamma energy

selected will be a function of thickness of emulsion. Statistical aspects of measurement are studied and other applications given. (EI, 1956)

**845. DETERMINATION OF SURFACE TENSION OF LIQUIDS**

Nadirashvili, S. A.

August 25, 1956

U.S. Department of Commerce, Washington, D.C.  
Russian Patent 103,386

A bubble of air, forced through a capillary into the liquid, is projected onto a screen for measurement. The air pressure in the bubble is regulated by a micrometric screw so that the bubble size at maximum curvature is constant.

**846. THE APPLICATION OF VACUUM ULTRA-VIOLET TECHNIQUES TO THE CONTINUOUS MONITORING OF TRACE CONCENTRATIONS OF WATER IN SEVERAL CASES**

Garton, W. R. S., Webb, M. S. W., Wildy, P. C.

December 1956

United Kingdom Atomic Energy Authority, Research Group, Atomic Energy Research Establishment, Harwell, Berks, England  
AERE C/R 2120, HD 2608 (HU)  
AD-136,812

**847. IONOPHORESIS, POLAROGRAPHY, AND NEPHELOMETRY IN STUDIES OF NUCLEIC ACIDS**

Golewski, S., Pilek, K.

Postepy Biochemii, v. 2, pp. 315–326, 1956

A review with 30 references is given.

**848. THE GETTERING PROCESS IN MODERN RECEIVING VALVE MANUFACTURE**

della Porta, P.

Vacuum, v. 6, pp. 41–58, 1956

Some performance characteristics of Ba getters are given for the absorption capacity for O, H<sub>2</sub>O, H, CO<sub>2</sub>, CO, N, and dry air. Absorption vs. time curves are given for H, CO<sub>2</sub>, CO, and N.

**849. ACCURATE SAMPLING**

Vondy, D.

Petroleum Engineer, v. 29: C, p. 18, February 1957

850. USE OF COILED CAPILLARIES IN CONVENIENT LABORATORY FLOWMETER  
Powell, H. N., Browne, W. G.  
*Review of Scientific Instruments*, v. 28, no. 2,  
pp. 138-141, February 1957

With coiled capillaries, basic simplicity of Hagen-Poiseuille flow equation can be retained at flow rates not achievable with straight capillaries; flow metering systems (for liquids or gases) using coiled capillaries are more reliable and accurate than many other types of systems, and require only commonly available laboratory apparatus. (*EI*, 1957)

851. CONTINUOUS DETERMINATION OF OXYGEN AND NITROGEN  
Roth, H.  
March 21, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 960,238

Nitrous oxides are formed by means of an electric arc, in mixtures of N and O. The oxide formation varies with the spark gap and the O/N ratio of the mixture. These oxides are absorbed in water and the change in electrical conductivity is measured.

852. SIMPLE DEVICE TAKES UNIFORM SAMPLE  
Goto, T., Hiraoka, T.  
*Chemical Engineering*, v. 64, p. 200, March 1957

853. AIR-TRANSPORTATION DEVICE FOR GAS-ANALYSIS APPARATUS  
Pankarz, W.  
April 18, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 962,207 (assigned to  
Auergesellschaft Aktien-Gesellschaft)

854. APPARATUS FOR DETECTING GASES AND ESTIMATING THEIR CONCENTRATION  
Eisenbarth, H.  
April 25, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 962,475 (assigned to  
Auergesellschaft Aktien-Gesellschaft)

855. INDICATING TUBES FOR GASES  
Heinrich, D., Dräger, B.  
May 16, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 963,906

Tubes used to indicate traces of a gas in gas mixtures or air are connected with a tube containing materials for purification of the gas stream.

856. CONCURRENT DETERMINATION OF SULFUR DIOXIDE AND NITROGEN DIOXIDE IN ATMOSPHERE  
Moore, G. E., Cole, A. F. W., Katz, M.  
*Air Pollution Control Association, Journal of the*,  
v. 7, no. 1, pp. 25-28, May 1957

Concurrent measurements were made in Windsor, Ontario, of low concentrations of sulphur dioxide by conductimetric and fuchsin methods, and of nitrogen dioxide by the Saltzman method. Three suitably adapted Aseco automatic impingers at the common atmospheric sampling point were used for the measurements. (*EI*, 1957)

857. GAS-ANALYSIS APPARATUS  
Grüss, H.  
June 6, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 965,171 (assigned to  
Siemens & Halske Aktien-Gesellschaft)

Gas mixtures are analyzed by comparing two hot-wire resistors which are placed in two chambers of different thermal convection.

858. GAS ANALYSIS BY ABSORPTION AND MEASUREMENT OF THERMAL CONDUCTIVITY  
Arnold, M.  
June 25, 1957  
U.S. Department of Commerce, Washington, D.C.  
East German Patent 13,378

The gas to be analyzed is passed through a tube equipped with two pilot wires, e.g., of Ni or Pt, to measure the thermal conductivity. Subsequently, it passes through a combustion tube or absorption solution and into a second tube (of the same temperature as the first) with two pilot wires. The four wires are connected to a wheatstone bridge, and indicated alteration of thermal conductivity shows that a component has been absorbed from the gas.

859. GAS ANALYZER FOR OXYGEN IN AIR AND GASES, ESPECIALLY IN MINE GAS  
Buchner K., Meis, J.  
July 4, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 1,011,640 (assigned to  
Ruhrchemie Aktien-Gesellschaft)
860. ANALYSIS APPARATUS FOR COMBUSTIBLE GASES  
Neumann, A.  
July 11, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 966,104 (assigned to  
Siemens & Halske Aktien-Gesellschaft)
861. SAMPLE SYSTEMS FOR PROCESS ANALYZERS  
Wall, R.  
*Industrial and Engineering Chemistry*, v. 49,  
Supplement 55A-56A, July 1957
862. AUTOMATIC DEVICE GETS TRUE SAMPLE  
Hicks, G. M., McKay, W. J.  
*Petroleum Refiner*, v. 36, pp. 183+, August 1957
863. THE DETERMINATION OF OXYGEN IN BERYLLIUM BY THE MICRO VACUUM FUSION METHOD  
Booth, E., Parker A.  
October 1957  
United Kingdom Atomic Energy Authority,  
Research Group, Atomic Energy Research Establishment, Harwell, Berks, England  
AERE-C/R 2376, HX 3542  
AD-158,865
864. MULTIPLE ANALYZER FOR GAS MIXTURES  
Luft, K. F.  
November 28, 1957  
U.S. Department of Commerce, Washington, D.C.  
German Patent 967,633 (assigned to Office  
National d'Etudes et de Recherches Aeronautiques  
[O.N.E.R.A.])
- Two infrared beams of equal intensity and frequency are used. One traverses the gas mixture to be analyzed, which then is passed through absorption chambers. The second beam penetrates the gas in an absorption chamber. The analysis is made by the difference of heat, pressure, etc.
865. SONIC GAS ANALYZER FOR MEASUREMENT OF CO<sub>2</sub> IN EXPIRED AIR  
Stott, F. D.  
*Review of Scientific Instruments*, v. 28,  
pp. 914-915, November 1957
866. PHOTOELECTRIC METHOD OF DETERMINATION OF NITROGEN IN ARGON  
Bochkova, O. P., Razumovskaya, L. P.,  
Sagaidak, V. G.  
*Kislorod*, v. 10, no. 4, pp. 24-27, 1957
- A photoelectric method for determining N in Ar containing 0.01 to 0.6% N is reported. The microammeter used was calibrated by means of industrial Ar with known N content. The photoelectric analytical results were compared with analysis by a Li apparatus and results from tests on welding of Al alloys. Rapidity, reliability and simplicity are attributes of this method.
867. SAMPLING DEVICE FOR CHROMATOGRAPHIC ANALYSIS  
Chmutov, K. V., Avgul, V. T.  
*Zhurnal Fizicheskoi Khimii*, v. 31, pp. 724-725,  
1957
- This sampling device for liquids has no rotating parts.
868. SIMPLIFIED HALDANE GAS ANALYZER  
Ganslen, R. V.  
*Institute of Science Technology, Journal of the*,  
v. 3, no. 4, pp. 23-28, 1957
- A simplified but sensitive apparatus for the analysis of CO<sub>2</sub> and O is described. The use of a catalyst tube and a thermo-barometric compensator is unnecessary.
869. ABSORPTIOMETRY  
Ledrut, J. H. T.  
*Pharmacien de France*, v. 8, no. 4, pp. 95-100,  
1957
- Fluorimetry, opacimetry, nephelometry, turbidimetry, and spectrophotometry are among the subjects reviewed.
870. VACUUM IN THE ANALYSIS OF GASES IN METALS  
Hanin, M.  
*La Vide*, v. 12, no. 68, pp. 148-161, 1957
- A sample of metal is heated to 2500°K by high frequency in a graphite crucible, with operating temperature

from 1600 to 1650°K. The gases, circulated by a Toepler pump, are collected over Hg. Samples of the 0.5 to 5.0 cc size range can be analyzed for CO, CO<sub>2</sub>, O, H, N, and CH<sub>4</sub>. Mg perchlorate and Na asbestos are used for H<sub>2</sub>O and CO<sub>2</sub> absorption, respectively. CO and H are burned on heated CuO. Examples of results are given.

871. COLUMN CHROMATOGRAPHY IN CELLOPHANE TUBES

Sabel, A., Kern, W.

*Chemiker-Zeitung*, v. 81, pp. 524–525, 1957

The desired section of the cellophane chromatography column can be cut out, allowing easy separation of the bands.

872. AIR SAMPLER

Finna, J.

January 14, 1958

U.S. Department of Commerce, Washington, D.C.  
German Patent 1,088,731 (assigned to  
Metrimpex Magyar Mueszeripari Kuelkereskedelmi  
Vallalat)

873. VACUUM FUSION APPARATUS FOR GAS ANALYSIS

Blake, P. D.

*Iron and Steel Institute, Journal of the*, v. 188,  
pp. 261–264, March 1958

874. REVIEW OF FUNDAMENTAL DEVELOPMENTS IN ANALYSIS

Hobbs, A. P.

*Analytical Chemistry*, v. 30, pp. 778–792;  
bibliography, pp. 789–792, April 1958

875. A DETECTION SYSTEM FOR OZONE-EMPLOYING POLYELECTROLYTE FILMS

Hirshon, J. M.

May 1958

Wright Air Development Center, Wright-Patterson AFB, Ohio

WADC-TR-58-50, AF 33(600)35218

AD-155,667

(Obtainable as PB 140,792, U.S. Dept. of  
Commerce, Office of Technical Services,  
Washington, D.C.)

A chemical film system for the detection and measurement of atmospheric O<sub>3</sub> is based on the oxidizing power of O<sub>3</sub> to produce ions in an otherwise essentially nonconducting system. The conductivity is then a measure of the

oxidation reaction and hence the O<sub>3</sub> concentration under experimental conditions. Another system based on the change in potential of a suitable oxidation-reduction electrode responds to O<sub>3</sub>. The sensitivity and time response characteristics of both these systems require additional development work before an O<sub>3</sub> sensitive film can be incorporated into a complete instrument.

876. THE CONSTRUCTION AND TESTING OF A "UNIVERSAL" LIGHT SCATTERING APPARATUS

Hughes, W. J., Johnson, P.

*Journal of Scientific Instruments*, v. 35, no. 5,  
pp. 157–159, May 1958

The apparatus described is suitable for the investigation of macro-molecules in solution. By the use of a parallel beam of light through the scattering solution, calibration anomalies were removed, and the apparatus can be calibrated by, or utilized for scattering measurements on, liquids of any refractive index. (PA, 1958, #3006)

877. DETERMINATION OF WATER VAPOR FROM THE CHANGE IN ELECTRICAL RESISTANCE OF A HYDROSCOPIC FILM

Weaver, E. R., Hughes, E. E., Diniak, A. W.

*National Bureau of Standards, Journal of Research of the*, v. 60, pp. 489–508, May 1958

878. APPARATUS FOR GAS ANALYSIS

Muzyczuk, J., Wilk, R.

June 10, 1958

U.S. Department of Commerce, Washington, D.C.  
Polish Patent 40,672 (assigned to Główny  
Instytut Górnictwa)

A diagram and explanation are presented for an apparatus usable for analyzing 10 cc amounts of gas with 0.02% volume accuracy.

879. HIGH TEMPERATURE THERMAL CONDUCTIVITY CELL

Felton, H. R., Buehler, A. A.

*Analytical Chemistry*, v. 30, p. 1163, June 1958

880. DEVICE FOR QUANTITATIVE ANALYSIS OF GASES USING INFRARED RADIATION

Winterling, K. H., Kowert, A.

July 22, 1958

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,844,729 (assigned to Hartmann & Braun Aktien-Gesellschaft)

Two infrared beams are used, and comparison is made between absorption by a standard sample and that by the unknown gas.

881. TWO INSTRUMENTS FOR MEASUREMENT OF OPTICAL PROPERTIES OF THE ATMOSPHERE

Pritchard, B. S., Elliott, W. G.

July 1958

Michigan, University of, Willow Run Labs.,  
Ypsilanti

Report 2144-250-T, DA 36-039-sc-52654  
AD-201,134

A description is given of the design and construction of two instruments for studying atmospheric optics. One device, the Recording Polar Nephelometer, measures the volume scattering index of light passing through a sample of natural atmosphere, with scattering angle, polarization, and wave length as variables. A new calibration procedure has been developed which employs a diffusing screen of known reflectance and transmittance as the standard. The second device, the Portable Transmissometer, measures the attenuation coefficient with an accuracy of 5% under all conditions. These instruments, when installed in a specially equipped station wagon, form a mobile research unit. Samples of results obtained in fog and clear air are included. (ASTIA)

882. SOME COMMENTS ON THE ANALYSIS OF GAS MIXTURES

Barnard, J. A., Hughes, H. W. D.

*Chemistry and Industry*, pp. 1109-1110,  
August 23, 1958

883. THE DEVELOPMENT OF METHODS OF REMOTE CONTROL OF OPERATIONS AT RADIOCHEMICAL LABORATORIES OF THE U.S.S.R. ACADEMY OF SCIENCES

Yakovlyev, G. N., Dedov, V. B.

United Nations, Geneva, Switzerland

A/CONF-15/P/2026

Proceedings of the Second United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland,  
September 1-13, 1958, v. 17, pp. 652-658

... Principles and diagrams of automation of the most labor-consuming separation processes based on precipitation, extraction, and chromatography methods are given. (NSA, 1959, #6399)

884. CARBON MONOXIDE INDICATOR

Bangsgaard, A. H.

September 4, 1958

U.S. Department of Commerce, Washington, D.C.  
German Patent, 1,113,596

A yellow composition is prepared by treating  $\text{SiO}_2$  gel with  $\text{PdCl}_4$  solution, drying, and treating with  $\text{CuCl}_2$  or  $\text{NH}_4\text{NO}_2$  solution. Air with 0.01% CO will darken the compound to black within 15 min.

885. REMOTE PIPETTER FOR HIGHLY RADIOACTIVE SAMPLES

Dykes, F. W.

In "Analytical Chemistry in Nuclear Reactor Technology. Part 2. Instrumentation, Remote Control Techniques, and Nucleonics," Second Conference, Gatlinburg, Tennessee, September 29-October 1, 1958, pp. 65-75

U.S. Atomic Energy Commission, Division of Technical Information, Rockville, Md.  
(Obtainable as TID-7568, U.S. Dept of Commerce, Office of Technical Services, Washington, D.C.)

The Remote Analytical Facility of the Idaho Chemical Processing Plant is in operation 24 hours a day for the analysis of highly radioactive liquid samples. The most important analytical apparatus in this facility is the remote pipetter which delivers sample aliquots for the various analytical determinations. The first pipetter used was patterned after one designed at Oak Ridge National Laboratory. Based upon operating experience with it, a revised unit has been designed. This new model, termed the RAF model B pipetter, utilizes the basic, proven features of the ORNL design while incorporating modifications to reduce maintenance requirements as well as to facilitate maintenance and decontamination procedures. The pipetter is a positive displacement, motor-driven type and employs the same Brown continuous-balance control system used previously. However, the upper inlet to the sample chamber is no longer controlled by the plunger but by an air-operated diaphragm valve. This feature permits instantaneous shutoff when full, simplifies the plunger design, reduces the possibility of plugging by eliminating small passageways, and permits filling or cleaning of the pipetter at any plunger position. Pipetter alignment is no longer accomplished by positioning the plunger but by rotating the balancing potentiometer. This permits disassembly of the sample-handling components without necessitating a tedious job of re-alignment. All susceptible parts, such as the servometer, potentiometer, and gears, are enclosed in a housing which is maintained under slight positive pressure. This permits

use of remote decontamination procedures without risk of damage to the mechanism. Many other minor improvements were made both in the pipetter design and the design of auxiliary apparatus used in conjunction with the pipetter. The end result is a remote pipetter designed to operate continuously under difficult conditions, with minimum maintenance. (NSA, 1959, #14,251)

**886. REMOTELY CONTROLLED ANALYTICAL FACILITIES FOR THE ANALYSIS OF SAMPLES FROM THE HOMOGENEOUS REACTOR. PARTS A THROUGH E**

Feldman, C., Musick, W. R., Horton, A. D., Farrar, L. G., Hobbs, B. B., Shults, W. D., Kelley, M. T., Stelzner, R. W., Fisher, D. J., Koskela, U., Attrill, J. E., Mottern, J. L.  
In "Analytical Chemistry in Nuclear Reactor Technology. Part 2. Instrumentation, Remote Control Techniques, and Nucleonics," Second Conference, Gatlinburg, Tennessee, September 29–October 1, 1958, p. 91–141  
U.S. Atomic Energy Commission, Division of Technical Information, Rockville, Md.  
(Obtainable as TID-7568, U.S. Dept. of Commerce Office of Technical Services, Washington, D.C.)

Sample preparation and excitation are performed in a shielded cell by means of manipulators. Light is conducted out of the cell by relay lenses into an Ebert spectrograph. Brief descriptions are given of the chemical treatment and excitation of (1) Homogeneous Reactor fuel and process solutions, (2) radioisotope preparations, and (3) miscellaneous solids of unknown composition. Special auxiliary devices and decontamination procedures are also described. An adaptation of Bozman's mercury cathode cell to facilitate the remote-control, coulometric analysis of Homogeneous Reactor fuel is described. The important features of the analysis are outlined and pertinent data are given. An improved servo-controlled, remotely operated pipetter has been designed for use in the High-Radiation-Level Analytical Facility (HRLAF). It is a component of instrumentation designed for the remote determination on the density of very radioactive samples by the falling-drop method. Instrumentation for the precise determination of the density of highly radioactive liquids by the falling-drop technique is discussed. The following units comprise the instrumentation: a 0.1-ml servo-driven pipet that delivers 5- $\mu$ l samples, a screw-driven elevator, a lazy-susan sample bottle holder, a motor-driven turret that indexes six fall-tubes, a thermostatted bath (30°C), an ORNL Q-1348 pipetter control unit, an ORNL Q-1551 photoelectric timer, and a thyra-

tron bias monitor. The falling-drop densimeter has been operated in the HRLAF for the determination of the density of Thorex process solutions and of high-percent-age heavy-water solutions. Relative standard deviations of results average 0.2 to 0.3%. The analytical operational experiences in the HRLAF during recent power operations of the Oak Ridge Homogeneous Reactor (HRT) are described. Among the subjects discussed are sample receiving and unloading, cell and manipulator maintenance, sampling, sample storage and disposal, and decontamination. (NSA, 1959, #14,254)

**887. SIMPLE THERMAL CONDUCTIVITY METER FOR GAS ANALYSIS WITH SPECIAL REFERENCE TO FUMIGATION PROBLEMS**

Heseltine, H. K., Pearson, J. D., Wainman, H.  
*Chemistry & Industry*, pp. 1287–1288,  
October 4, 1958

**888. THE REMOTE ANALYTICAL FACILITY MODEL "B" PIPETTER**

Dykes, F. W., Morgan, J. P., Rieder, W. G.  
October 20, 1958  
U.S. Atomic Energy Commission, Idaho Operations Office, Rockville, Md.  
IDO-14456, AT (10-1)-205  
(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The RAF Model B pipetter is a device designed to pipet aliquots of highly radioactive samples. It incorporates features of two previous models and several years of operating experience. Design criteria were accuracy of delivery, reliability of operation, and ease of operation and maintenance. A complete description of the pipetter and its operation and maintenance is presented. (NSA, 1959, #2903)

**889. NEW PROPORTIONAL COUNTERS FOR GASES AND VAPORS**

Wolfgang, R., MacKay, C. F.  
*Nucleonics*, v. 16, pp. 69–73, October 1958

**890. A REMOTELY CONTROLLED SHIELDED EVAPORATOR FOR LABORATORY USE**

Howarth, A. J.  
November 14, 1958  
United Kingdom Atomic Energy Authority,

Industrial Group, Windscale Works, Sellafield,  
Cumberland, England  
IGO-R/W-70

An evaporator is described for the concentration of, and removal of chloride from, waste liquors arising from the analysis of high activity samples. The entire unit may be assembled, operated and disassembled remotely and requires no attention other than the removal of its product. Nitric acid is also removed from active liquors during the process. The possible use of the unit for evaporation of highly active plant waste solutions is considered. (NSA, 1959, #16,149)

891. ELECTROCHEMICAL METHOD AND APPARATUS FOR GAS DETECTION

Jacobson, M. G.  
November 25, 1958

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,861,926 (assigned to Mine Safety Appliances Co.)

A polarized electrode of carbon, with a bore through its length, is used for electrochemical detection of an oxidizing gas. The gas flows through the bore and diffusion of gas through "windows" depolarizes the electrode. The electrolyte used is 2-5% acidic NH<sub>4</sub>Cl and the second electrode is Zn.

892. GAS-ANALYSIS APPARATUS

Axt, G.  
December 9, 1958

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,863,736 (assigned to Hartmann & Braun Aktien-Gesellschaft)

Conductivity or temperature change of a reaction liquid indicates the gas content. A compact unit is made up of the reaction tube, inlet tubes, and sensor or detector.

893. INSTRUMENT FOR GAS ANALYSIS WITH HEATED WIRE SYSTEM (DIFFERENTIAL THERMAL CONDUCTIVITY CELL)

Axt, G., Lotz, F.  
December 20, 1958  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,866,330 (assigned to Hartmann & Braun Aktien-Gesellschaft)

A 0.25-mm-D cell is used in conjunction with a wheatstone bridge, and analysis is based on change in thermal conductivity or heat of combustion. A magnetic-field method for O analysis is also mentioned.

894. PORTABLE MULTI-RANGE NITROGEN DIOXIDE GAS MONITOR

Adley, F. E., Skillern, C. P.

*American Industrial Hygiene Association Journal*, v. 19, pp. 233-237, 1958

As little as 0.5 ppm NO<sub>2</sub> can be detected in less than 1 min, and the maximum level is about 15,000 ppm. The sample and the reagent, N-(1-naphyl)ethylene-diamine-di-HCl, flow concurrently through a beaded column. A colorimeter picks up color changes caused by diazotization. The instrument is portable and needs little attention.

895. MEASUREMENT OF TRACES OF GASES IN THE STEEL MILL

Bangert, F.  
*Stahl und Eisen*, v. 78, pp. 743-747, 1958

A portable gas detector based on the heat of reaction in oxidizing CO to CO<sub>2</sub> is described for continuous monitoring of air for CO.

896. CHEMICAL COMPOSITION OF GASES IN ROCKS AND THE FORMATION OF HYDROGEN AND HYDROCARBONS UNDER NATURAL CONDITIONS

Gurevich, M. G.  
In "Geokhimicheskie Metody Poiskov Neftyanykh i Gazovykh Mestorozhdenii," Akademiya Nauk SSSR, Institut Geologii i Razrabotki Goryuchikh Iskopayemykh, Trudy Soveshchaniya po Geokhimicheskim Metodam, Moscow, April 21-26, 1958," pp. 175-178  
Akademiya Nauk SSSR, Moscow, 1959

897. A SAMPLING DEVICE FOR TESTING GASES DISSOLVED IN WATER

Ozolin, B.

In "Geokhimicheskie Metody Poiskov Neftyanykh i Gazovykh Mestorozhdenii," Akademiya Nauk SSSR, Institut Geologii i Razrabotki Goryuchikh Iskopayemykh, Trudy Soveshchaniya po Geokhimicheskim Metodam, Moscow, April 21-26, 1958," pp. 205-206  
Akademiya Nauk SSSR, Moscow, 1959

898. METHODS AND APPARATUS FOR GAS ANALYSIS AND WAYS OF THEIR IMPROVEMENT

Sokolov, V. A.

- In "Geokhimicheskie Metody Poiskov Neftyanykh i Gazovykh Mestorozhdenii," Akademiya Nauk SSSR, Institut Geologii i Razrabotki Goryuchikh Iskopаемых, Trudy Soveshchaniya po Geokhimicheskim Metodam, Moscow, April 21–26, 1958" pp. 211–221  
Akademiya Nauk SSSR, Moscow, 1959
899. METHODS AND APPARATUS FOR GAS ANALYSIS AS APPLIED TO GEOCHEMICAL PROSPECTING FOR PETROLEUM AND GAS DEPOSITS  
Gurevich, M. G.  
In "Geokhimicheskie Metody Poiskov Neftyanykh i Gazovykh Mestorozhdenii," Akademiya Nauk SSSR, Institut Geologii i Razrabotki Goryuchikh Iskopаемых, Trudy Soveshchaniya po Geokhimicheskim Metodam, Moscow, April 21–26, 1958," pp. 232–234  
Akademiya Nauk SSSR, Moscow, 1959
900. GAS ULTRAMICROANALYZER  
Yuranek, Yu.  
In "Geokhimicheskie Metody Poiskov Neftyanykh i Gazovykh Mestorozhdenii," Akademiya Nauk SSSR, Institut Geologii i Razrabotki Goryuchikh Iskopаемых, Trudy Soveshchaniya po Geokhimicheskim Metodam, Moscow, April 21–26, 1958," pp. 249–251  
Akademiya Nauk SSSR, Moscow, 1959
901. SPECTRAL ANALYSIS OF MICROQUANTITIES OF A GAS  
Bochkova, O. P., Razumovskaya, L. P., Frish, S. E.  
*Optika i Spektroskopiya*, v. 5, pp. 624–626, 1958  
Spectral analysis for microquantities of gas is explained. The necessary pressure is attained by compression of the gas in a capillary and addition of inert gas to the sample. Calibration curves for the use of the method for O and Ar in air are given.
902. POSSIBILITY OF BUILDING A GAS ANALYZER BASED ON THE NEGATIVE OPTICO-ACOUSTIC EFFECT WITHOUT USING A LOW-TEMPERATURE COOLER  
Bresler, P. I.  
*Optika i Spektroskopiya*, v. 5, pp. 220–222, 1958  
The use of such an analyzer for determination of  $\text{CO}_2$ ,  $\text{CH}_4$  and  $\text{C}_2\text{H}_6$  is discussed.
903. PHOTOCOLORIMETRIC GAS ANALYZER FOR THE DETERMINATION OF TOXIC CONCENTRATIONS OF NITROGEN OXIDES IN AIR  
Borok, M. T.  
*Zavodskaya Laboratoriya*, v. 24, pp. 1128–1134, 1958  
An apparatus for photocalorimetric determination of nitrogen oxides is described. NO is oxidized to  $\text{NO}_2$  by introducing  $\text{O}_3$  in the approximate ratio of  $\text{O}_3/\text{NO} = 5.7$ , and, subsequently, excess  $\text{O}_3$  is destroyed by heating to  $300^\circ\text{C}$ . This temperature is well below that causing dissociation of the  $\text{NO}_2$ .
904. CONTINUOUS RECORDED DETERMINATIONS OF TRACES OF OXYGEN IN INDUSTRIAL GASES  
Egalon, R., Jarcsek, F., Tella, R., Copin, C.  
In "Industrie Chimique Belge Supplement; Compte Rendu Congrès International de Chimie Industrie, 31<sup>e</sup> Congrès, Liege, 1958," v. 1, pp. 844–851 (in French)  
Fédération des Industries Chimique de Belgique, Brussels, Belgium, 1959  
Both photocalorimetric and electroconductometric methods are used. The former is used for determination of O in hydrocarbons, the latter for determination of O, CO or  $\text{CO}_2$  in N or H.
905. THE APPLICATION OF PHENOLPHTHALIN REAGENT TO ATMOSPHERIC OXIDANT ANALYSIS  
Haagan-Smit, A. J., Brunelle, M. F.  
*International Journal of Air Pollution*, v. 1, pp. 51–59, 1958  
Phenolphthalin is oxidized to phenolphthalein, and a colorimetric determination of the oxidant present is made therefrom. The sampler used is described, and results are given.
906. PURIFICATION OF AIR IN SEALED CABINS. THE CHEMICAL AND PHYSICAL ELIMINATION OF CARBON DIOXIDE AND OTHER SUBSTANCES PRODUCED BY MAN  
Scano, A.  
In "Congrès Mondial de Médecine Aéronautique, 3<sup>e</sup> Congrès Européen, Louvain, Belgium, 1958," pp. 54–61  
Aeroport de Bruxelles-National, Brussels, Belgium, 1958

Closed-circuit breathing tests were conducted with human subjects. Carbon dioxide absorbents tried were: (1) NaOH, (2) monoethanolamine followed by a tube containing molecular sieve Type 5A for absorption of NH<sub>3</sub>, (3) soda-lime, (4) LiOH solution, (5) monoethanolamine alone, and (6) molecular sieve Type 5A alone. The last three were unsatisfactory. A compression and refrigeration cycle is recommended.

**907. INSTRUMENT FOR ANALYSES OF RESPIRATORY GASES AND ITS MANIPULATION**

Strüss, F., Quasdorf, T.

*Archiv für Tierernährung*, v. 8, pp. 433–446, 1958

An apparatus for measuring O and CO<sub>2</sub> is described.

**908. MONITORING FOR CARBON MONOXIDE AND CARBON DIOXIDE**

Holmes, A.

1958

United Kingdom Atomic Energy Authority, Research Group, Atomic Energy Research Establishment, Harwell, Berks, England

MED/R 2643

A review of detection methods for CO and CO<sub>2</sub> in the atmosphere is presented. The IR gas analyzer usable for both gases is described.

**909. ANALYSIS FOR INDUSTRY**

Korble, J.

*Industrial Chemist and Chemical Manufacturer*, v. 34, pp. 507–510, 1958

Developments in microdetermination of C and H are discussed. 77 references.

**910. ANALYSIS FOR INDUSTRY**

Korble, J.

*Industrial Chemist and Chemical Manufacturer*, v. 34, pp. 563–566, 1958

A review is presented of microdeterminations of O, N, Cl, Br, S, F, P, I, As, Sb, Si, and several metals. 116 references.

**911. VOLTAMETRIC METHOD OF ANALYSIS WITH ROTATING PLATINUM WIRE ELECTRODE. III. DETERMINATION OF DISSOLVED OXYGEN**

Hashimoto, J.

*Nippon Kagaku Zasshi*, v. 79, pp. 583–586, 1958

**912. AMPEROMETRIC DETERMINATION OF THE CONCENTRATION OF OZONE IN A GAS STREAM**

Kasatkin, E. V.

*Zavodskaya Laboratoriya*, v. 24, pp. 407–409, 1958

The amperometric method is based on a polarographic method for determination of O<sub>3</sub> in acid solutions during electrochemical reduction at a revolving Pt electrode. One of two waves noted on the I-E curve is related to reduction of O<sub>3</sub>. The half-wave reduction potential is dependent upon temperature and acid solution, and the limiting reduction current is proportional to the concentration of O<sub>3</sub>.

**913. A NEW METHOD OF DIRECT DETERMINATION OF ARGON AND NITROGEN**

Koyama, T.

*Journal of Earth Sciences, Nagoya University*, v. 6, pp. 1–11, 1958 (in English)

Nitrogen is determined by forming a nitride with Ca or Ba, and reacting this nitride with glycerol. The method, usable for gases, waters, or soils, is explained and the apparatus described.

**914. PORTABLE APPARATUS FOR DETERMINING THE CARBON DIOXIDE CONTENT OF AIR**

Kudryavtsev, A. A.

*Veterinariya*, v. 35, no. 12, pp. 64–66, 1958

Hydrogen chloride with methyl orange is used. The measurement is made with two gas burets (100 ml capacity) equipped with capillaries having 0.01-ml graduations near the end. One of the burets is filled with air to serve as a control for pressure and temperature changes. The two burets are immersed in a moving water bath.

**915. GAS ANALYSIS**

Lada, Z., Waclawik, J., Waszak, S.

*Chemia Analityczna*, v. 3, pp. 329–348, 1958

A review of methods of analysis and separation is presented. Gas chromatography, adsorption, and other physical and chemical methods are discussed and compared. 159 references.

916. MODIFIED SCHOLANDER APPARATUS FOR ACCURATE ESTIMATION OF CARBON DIOXIDE IN SMALL SAMPLES OF EXPIRED AIR

Levy, L. M., Bernstein, L. M., Devor, D., Kirschner, S. L., Long, J. E., Stadler, J.  
*Journal of Applied Physiology*, v. 13, pp. 309–312, 1958

Structural design changes in the Scholander apparatus are explained. These modifications, which were made in order to avoid leakage, did not lessen the accuracy of the method.

917. PHOTOELECTRIC RECORDING INTERFEROMETER FOR GAS ANALYSIS

Namba, S.  
*Rika Gaku Kenkyūsho Hōkoku*, v. 34, pp. 252–259, 1958

918. THE INVESTIGATIONS OF THE NEPHELOMETRIC AND CALORIMETRIC REACTIONS FOR THE DETERMINATION OF SMALL AMOUNTS OF SUBSTANCES

Petrov, A. M.  
*Trudy po Khimii i Khimicheskoi Teknologii*, v. 1, pp. 603–604, 1958

919. INFRARED CELL FOR SMALL GAS SAMPLES

Russell, O. S.  
*Canadian Journal of Chemistry*, v. 36, pp. 1745–1746, 1958

This pyrex cell is wedge-shaped and has a volume of 7.5 ml and a length of 5 cm. It has a freeze-out tube, NaCl windows, and a capillary top.

920. CONTINUOUS COULOMETRIC DETERMINATION OF OXYGEN IN A GAS

Sakamaki, I., Yuki, S.  
*Bunseki, Kagaku*, v. 7, pp. 33–37, 1958

The O reacting with Cr<sup>++</sup> in a cell solution is measured. The concentration of Cr<sup>++</sup> is kept constant by an electrolytic generating current, and since the O content is almost proportional to the controlled electrolytic current, it can be read directly.

921. A CONTINUOUS INFRARED ANALYZER FOR MEASUREMENT OF CARBON DIOXIDE IN EFFLUENT AIR FROM BACTERIAL CULTURES

Telling, R. C., Elsworth, R., East, D. N.  
*Journal of Applied Bacteriology*, v. 21, pp. 26–44, 1958

A review is made of continuous IR absorption analysis techniques. A British IR analyzer for CO<sub>2</sub> is described and evaluated, and the use of this analyzer in measuring CO<sub>2</sub> content of air from deep cultures of microorganisms is reported.

922. PORTABLE CONDUCTOMETRIC GAS ANALYZER FOR THE DETERMINATION OF CARBON MONOXIDE AND CARBON DIOXIDE IN AIR

Volberg, N. Sh.  
*Trudy Nauchnoi Sessii Leningradskogo Nauchno-Issledovatelskogo Instituta Gigienny Truda i Profzabolevanii Posvyashchennoi Itogam Raboty*, pp. 158–164, 1958

The apparatus comprises collecting, purifying, oxidizing, absorption and electrical measuring systems. CO<sub>2</sub> is absorbed in 10 ml 0.005 N NaOH containing 0.1% butyl alcohol. An alternating voltage (100 v) is used with germanium diodes for rectifiers. A microampere meter picks up the output. The system shows a good sensitivity.

923. GAS ANALYZER

Bresler, P. I.  
January 19, 1959  
U.S. Department of Commerce, Washington, D.C.  
Russian Patent 116,724

Thermaphones generate acoustic vibrations in a chamber of unknown gas and in a control chamber. The vibrations are picked up by microphones.

924. LIQUID SCINTILLATOR LUMINOSITY AS AN INDICATOR FOR OXYGEN IN GASES

Chleck, D. J., Brinkerhoff, J., Hadley, W., Ziegler, C. A.  
*Review of Scientific Instruments*, v. 30, pp. 37–38, January 1959

925. GAS ANALYSIS BY OPTICAL INTERFEROMETRY

Hanson, D. N., Maimoni, A.  
*Analytical Chemistry*, v. 31, pp. 77–82, January 1959

926. POLAROGRAPHY OF GASES, QUANTITATIVE STUDIES OF OXYGEN AND SULFUR DIOXIDE

Sawyer, D. T., George, R. S., Rhodes, R. C.  
*Analytical Chemistry*, v. 31, pp. 2-5,  
January 1959

927. SPECIAL SAMPLING SYSTEM ALLOWS CONTINUOUS METHANE MEASUREMENT IN MISSOURI RIVER FUEL PLANT; INFRARED ANALYZERS USED IN AMMONIA PLANT

*Gas Age*, v. 123, pp. 46, 48, February 5, 1959

928. SIMPLE STERILISABLE SAMPLE DEVICE

Hyde, K. A.  
*Chemistry & Industry*, p. 327, March 7, 1959

929. ACOUSTIC GAS ANALYSER

Molyneux, L.  
*Journal of Scientific Instruments*, v. 36, no. 3,  
pp. 118-120, March 1959

A transistorized instrument is described which is capable of measuring concentration of halothane or chloroform vapor over a range of 0 to 4% by volume, with accuracy of  $\pm \frac{1}{2}\%$ . Gas containing vapor is a mixture of air and oxygen; the instrument compares the time taken by pulse of sound to travel through original gas sample with the time taken for another pulse to travel through the same sample after removal of vapor by activated charcoal. (*EI*, 1959)

930. DETERMINATION OF TOTAL GASEOUS POLLUTANTS IN ATMOSPHERE

West, P. W., Sen, B., Sant, B. R.  
*Analytical Chemistry*, v. 31, pp. 399-401,  
March 1959

931. GAS ANALYZER

Johnson, K. W.  
April 21, 1959  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,883,270 (assigned to Johnson-Williams, Inc.)

This analyzer is designed to prevent explosion by detecting dangerous concentrations in combustible mixtures. A catalytic filament is used with a thermally conductive filament, and a wheatstone bridge connection is made.

932. PORTABLE ANALYZER FOR DETERMINATION OF DISSOLVED OXYGEN IN WATER; APPLICATION OF RAPID-DROPPING MERCURY ELECTRODE

Tyler, C. P., Karchmer, J. H.  
*Analytical Chemistry*, v. 31, pp. 499-502,  
April 1959

933. POLAROGRAPHIC DETERMINATION OF OXYGEN; ANOMALOUS CURRENT ENCOUNTERED WITH RAPID-DROPPING MERCURY ELECTRODE

Karchmer, J. H.  
*Analytical Chemistry*, v. 31, pp. 509-513,  
April 1959

934. REVIEW OF APPLIED ANALYSIS; AUTOMATIC OPERATIONS IN ANALYTICAL CHEMISTRY

Patterson, G. D., Jr.  
*Analytical Chemistry*, v. 31, pp. 646-655,  
pt. 2, April 1959

935. ELECTROCHEMICAL METHOD DETECTS AND MEASURES OXYGEN CONTENT

*Engineering and Mining Journal*, v. 160, p. 45,  
April 1959

936. SELECTION OF COMPONENTS FOR GAS ANALYZER SAMPLING SYSTEMS

Cotter J. L., Maley, L. E.  
*Chemical Engineering Progress*,  
v. 55, pp. 122, 124, 126, May 1959

937. RAPID METHOD FOR DETERMINATION OF SMALL AMOUNTS OF CARBON MONOXIDE IN GAS MIXTURES

Lysyj, I., Zaremba, J. E., Hanley, A.  
*Analytical Chemistry*, v. 31, pp. 902-904,  
May 1959

938. METHOD OF INCREASING THE SENSITIVITY AND STABILITY OF THERMISTOR THERMAL-CONDUCTIVITY GAS ANALYZERS

Walker, R. E.  
*Review of Scientific Instruments*,  
v. 30, p. 378, May 1959

939. CONTINUOUS ANALYSIS OF GAS MIXTURES BY COMPOSITION MODULATION

June 3, 1959

U.S. Department of Commerce, Washington, D.C.  
British Patent 814,317 (assigned to Esso Research and Engineering Co.)

The differential in pressure-varied absorption of a gas is detected by thermocouples and is compared with that of a control gas mixture.

940. GALVANIC CELL OXYGEN ANALYZER AT MONSANTO'S TEXAS CITY PLANT

Baker, W. J., Combs, J. F., Zinn, T. L.,  
Wotring, A. W., Wall, R. F.

*Industrial and Engineering Chemistry*,  
v. 51, pp. 727-730, June 1959

941. SPECTROPHOTOMETRIC TITRATION OF PARTS PER MILLION OF CARBON DIOXIDE IN GASES

Loveland, J. W., Adams, R. W., King, H. H., Jr.,  
Nowak, F. A., Cali, L. J.

*Analytical Chemistry*, v. 31, pp. 1008-1010,  
June 1959

942. A REMOTE PHASE SEPARATION BULB FOR HIGHLY RADIOACTIVE SAMPLE ANALYSES

Campbell, M. H.

July 21, 1959

General Electric Company, Hanford Atomic Products Operation, Richland, Wash.  
HW-61179

(Also available through U. S. Dept of Commerce,  
Office of Technical Services, Washington, D. C.)

The separation bulb was designed to handle hot samples with a minimum of operator exposure. The separation bulb is an adaptation of an undocumented reaction vessel designed for colorimetric phosphate determination. A detailed description is given of the bulb and its operation. (NSA, 1959, #20,886)

943. DETECTION DEVICE FOR CARBON MONOXIDE AND CARBON DIOXIDE IN GASEOUS MIXTURES

Van Luik, F. W., Jr.

July 28, 1959

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,897,059 (assigned to General Electric Co.)

Condensation nuclei are produced by passing carbon compounds through a corona discharge (forming metallic carbonyls which, in solution, produce the measurable nuclei).

944. MODIFIED SARGENT-MALMSTADT AUTOMATIC TITRATOR FOR REMOTE CONTROL USE WITH PLUTONIUM SOLUTIONS

Waterbury, G. R.

*Analytical Chemistry*, v. 31, pp. 1138-1141,  
July 1959

Several modifications are described to adapt the commercially available, differential-potentiometric automatic titrator for use with plutonium solutions and to improve parts of it for specific purposes. These modifications include replacing the gravity-flow buret with a motor-driven syringe buret, replacing the stirrer with a magnetic stirrer, rewiring the titrator for remote operation inside a plutonium dry box or hood, and adding a microammeter to indicate potential changes. For trial titrations of cerium and chromium with iron, standard deviations of less than 0.01 relative % were obtained by using large samples and weight burets with the modified titrator. (NSA, 1959, #16,165)

945. APPARATUS FOR ELECTROLYTIC OXYGEN ANALYSIS

Flook, W. M., Jr., Keidel, F. A.

August 4, 1959

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,898,282 (assigned to E. I. duPont de Nemours & Co.)

Oxygen concentrations are coulometrically determined.

946. GAS ANALYSIS

Sall, A. O.

August 5, 1959

U.S. Department of Commerce, Washington, D.C.  
USSR Patent 121,593

An infrared radiation method is claimed for determining the concentration of any one component.

947. CONTINUOUS DETERMINATION OF CARBON MONOXIDE AND HYDROCARBONS IN AIR BY MODIFIED INFRARED ANALYZER

Jacobs, M. B., Braverman, M. M., Hochheiser, S.  
*Air Pollution Control Association, Journal of the*,  
v. 9, no. 2, pp. 110-114, August 1959

Performance characteristics, operating principles, and calibration methods of a selective, nondispersion-type instrument are described. Methods are given for increasing sensitivity in order to measure CO in the ranges of 0 to 20 ppm and 0 to 50 ppm and hydrocarbons in the ranges of 0 to 5 ppm and 0 to 10 ppm. Interference is eliminated. (*EI*, 1959)

**948. PHOTOELECTRIC RECORDING INTERFEROMETER FOR GAS ANALYSIS**

Namba, S.

*Review of Scientific Instruments*, v. 30, no. 8,  
pp. 642–645, August 1959

Improvements introduced, particularly in automatic recording device of Riken gas indicator, were devised on the principle of an optical interferometer in order to make it usable in industrial applications. Its sensitivity is about  $1 \times 10^{-8}$  index unit, or in the case of  $\text{CO}_2$  gas in air, about 0.01% by volume. (*EI*, 1959)

**949. DEVICE FOR ADMITTING GAS AT CONSTANT RATE TO VACUUM APPARATUS**

Osborne, A. D.

*Journal of Scientific Instruments*, v. 36,  
pp. 370–371, August 1959

**950. INTERNAL ELECTROLYSIS-COULOMETRIC METHOD FOR DETERMINATION OF SMALL QUANTITIES OF OXYGEN; APPLICATION TO INDIVIDUAL SAMPLES**

Knapp, W. G.

*Analytical Chemistry*, v. 31, pp. 1463–1467,  
September 1959

**951. IMPROVED VACUUM FUSION GAS EXTRACTION AND COLLECTION APPARATUS**

Lench, A., Martin, G. S.

*Analytical Chemistry*, v. 31, pp. 1726–1729,  
October 1959

**952. FURTHER ADVANCES IN DISSOLVED OXYGEN MICROANALYSIS**

Potter, E. C., Everitt, G. E.

*Journal of Applied Chemistry*, v. 9, pp. 642–650,  
December 1959; v. 10, pp. 48–56, January 1960

**953. ELECTROLYTIC DETECTOR OF VAPORS AND GAS IN THE ATMOSPHERE [LABORATORY NOTE]**

Berton, A.

*Bulletin de la Société Chimique de France*,  
p. 536, 1959

A small electrolytic cell is produced by a metallic wire capillary holding a drop of liquid, with a second metallic electrode touching the liquid. The electromotive force of the cell varies with the gas reacting with the liquid.

**954. GAS ADSORPTION ON BARRIER LAYERS OF SEMI CONDUCTORS**

Plagemann, H. H.

*Nachrichtentechnik*, v. 9, pp. 292–295, 1959

A review is presented of the effects of gas adsorption (e.g., O, N,  $\text{H}_2\text{O}$ ,  $\text{O}_3$ , air, and organic solvents) on electrical properties of semiconductors.

**955. GALVANIC CELLS SENSITIVE TO TRACES OF GASEOUS, LIQUID, OR SOLID SUBSTANCES**

Berton, A.

*Chimie Analytique*, v. 41, pp. 351–358, 1959

The apparatus described consists of a glass container in which a stream of gas (which may contain liquid or solid particles) flows onto a drop of solution held on a metallic electrode and touched by a second electrode. The action of the cell varies with the impinging gas stream. The composition of the gas stream necessitates some variation in electrode metal and in the solution used.

**956. ACOUSTIC GAS ANALYZER**

Bogardus, B. J., Ritter, R. C.

Atomic Energy Commission, Rockville, Md.

1959

K-1240

An electro-acoustic type instrument measuring velocity of sound in binary gas mixtures is described. The velocity can be interpreted to indicate the mole fraction of one of the components. Problems connected with the diaphragms in the resonating chamber are discussed.

**957. EQUIPMENT FOR THE REMOTE OPENING OF GLASS AMPOULES CONTAINING RADIOACTIVE MATERIAL**

Bucina, I.

*Jaderna Energie*, v. 5, p. 413, 1959  
(in Czechoslovakian)

The design and performance characteristics of a novel remote manipulator for opening glass ampules containing radioactive materials are described. The well-known method of first heating the glass with a hot wire and then rapidly chilling the area with water or other liquid is employed for cutting the ampule open, using a 220 to 224 v fast transformer as source of current. The secondary coil can be adjusted in two steps from 0 to 12 v. Design of the head is unique because it not only holds the hot wire used for cutting the glass but it is provided with a syringe by means of which cold water can be squirted onto the heated areas of the glass. An extension tube contains the necessary electrical connections for the removable cutting head, while the other end of this tube is fastened to a pistol grip similar to that of a Weyland solder gun. All the electric controls are placed on this grip, while a separate rubber tube and bulb control the syringe head. Details of construction are illustrated by figures. (NSA, 1960, #19,070)

958. THE FRACTIONAL SIMULTANEOUS DETERMINATION OF CARBON DIOXIDE AND CARBON MONOXIDE  
Coppens, L., Brieteux, J.  
*Institut National de l'Industrie Charbonnière, Bulletin Technique—Houille et Dérivés*, no. 17, pp. 524–543, 1959

Carbon dioxide is determined in a gas chromatography column of silica gel. Subsequently the CO<sub>2</sub> is removed, the gas is dried, and CO is oxidized by I<sub>2</sub>O<sub>5</sub> to CO<sub>2</sub>, which is then determined. The method is accurate for small traces of CO and CO<sub>2</sub>.

959. SELECTION OF COMPONENTS FOR GAS ANALYZER SAMPLING SYSTEMS  
Cotter, J. L., Maley, L. E.  
*Chemical Engineering Progress*, v. 55, no. 5, pp. 122, 124, 126, 1959

A review and comparison of commercial parts are given.

960. REMOVAL OF OXYGEN FROM INERT GASES WITH ACTIVATED COPPER  
Gamisch, G., Rüttiger, W.  
*Glas-Instrumenten Technik*, v. 3, pp. 370–373, 1959

961. AIR POLLUTION SAMPLING AND ANALYSIS WITH SPECIAL REFERENCE TO SULFATE PULPING OPERATIONS  
Hendrickson, E. R.  
*Tappi*, v. 42, no. 5, pp. 173A–176A, 1959

Techniques and procedures are discussed which are used for atmospheric and aerial sampling and analysis of objectionable discharges from kraft pulping operations. The procedures are not yet ready for routine use. The gas is drawn through a weighed filter thimble and into absorption channels. Particulates are caught in the filter and subsequent weighing determines their extent. Determination of both SO<sub>2</sub> and H<sub>2</sub>S is made by colorimetry following absorption.

962. CONTINUOUS DETERMINATION OF CARBON MONOXIDE AND HYDROCARBONS IN AIR BY A MODIFIED INFRARED ANALYZER  
Jacobs, M. B., Braverman, M. M., Hochheiser, S.  
*Air Pollution Control Association, Journal of the*, v. 9, pp. 110–114, 1959

A Luft-type infrared analyzer is used with increased sample-tube length and increased sampling pressure.

963. PHOTOELECTRIC METHOD IN DETERMINING SMALL AMOUNTS OF OXYGEN IN A GASEOUS MIXTURE  
Lin, K.-T.  
*Hua Hsueh Shih Chieh*, pp. 166–168, 1959

Carbon monoxide and hydrogen sulfide are removed before the gaseous mixture is used for oxidation of Cu(NH<sub>3</sub>)<sub>2</sub><sup>+</sup>. Colorimetric examination is made of the reaction product.

964. LINEAR COLORIMETRIC METHOD OF DETERMINING CARBON DIOXIDE CONCENTRATIONS IN THE ATMOSPHERE  
Lukina, M. T., Borodina, G. L.  
*Gigiena i Sanitariya*, v. 24, no. 8, pp 80–82, 1959

Silica gel containing colorless basic fuchsin-hydrazine hydrate compound becomes rose colored upon contact with CO<sub>2</sub> in air. The gel is contained in a tube and the length of the colored portion in the tube is indicative of the quantity of CO<sub>2</sub>.

965. INDICATOR TUBE FOR RAPID DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE OF INDUSTRIAL PLANTS

Mokhov, L. A., Udalov, Yu. F., Khalturin, V. S.  
*Zhurnal Prikladonoi Khimii*, v. 32, pp. 452–453,  
1959

(Also available as Russian Patent 110,047,  
U.S. Dept. of Commerce, Washington, D.C.)

Silica gel, treated with several alcohol solutions, is packed in a tube 3 to 5 mm in diameter and 80 to 100 mm long. A color change from pink to maroon, caused by diazotization, is proportional to the concentration of N oxides in the gas. The method is sensitive to within 0.0005 mg/l.

966. AUTOMATIC APPARATUS FOR THE DETECTION AND RECORDING OF NITRIC OXIDE IN COKING GAS

Pierrain, J.

*Chimie Analytique*, v. 41, pp. 477–485, 1959

NO is oxidized to  $N_2O_3$  and  $N_2O_5$  by electrolytically generated O. The reaction products of  $N_2O_3$  and  $N_2O_5$  with a Griess reagent are examined colorimetrically.

967. MODIFICATION OF ANALYZER FOR THE ESTIMATION OF SMALL AMOUNTS OF OXYGEN IN GASES

Pour, V., Müller, J.

*Chemický Prumysl*, v. 9, pp. 630–632, 1959

The difference in color of oxidized and reduced forms of Na 2-anthraquinone-sulfonate is determined photo-colorimetrically.

968. MEASURING RAPIDLY CHANGING OXYGEN CONTENTS OF GAS MIXTURES BY ABSORPTION SPECTROSCOPY IN THE SCHUMANN REGION

Prugger, H., Ulmer, W.

*Zeitschrift für Angewandt Physik*, v. 11, 467–470,  
1959

The 1600–1350 Å range was used for measuring O because N,  $CO_2$ ,  $N_2O$  and  $H_2O$  do not interfere a great deal in that spectral region. A tungsten photocell was used as detector. A fairly accurate reading can be obtained in less than 0.1 sec.

969. ABSORPTION OF CARBON DIOXIDE BY POLYMERIC AMINES

Robins, J. (Polytechnic Institute of Brooklyn, N.Y.,  
1959, Thesis)

*Dissertation Abstracts*, v. 20, pp. 1194–1195, 1959  
(Microfilm available as Mic 59-3635, University  
Microfilms, Ann Arbor, Mich.)

970. TOXICOLOGICAL EXAMINATION OF ATMOSPHERE POLLUTIONS. I. SIMPLE CONTROL DEVICES

Sacchi, S., Poggi, P. G., Poggi, A. R.  
*Chimica*, Milan, v. 35, pp. 493–498, 1959

Rapid methods of determining  $CO_2$  in air are reviewed. The time of decolorizing a very dilute alkaline solution when shaken in air is considered.

971. METHODS FOR SAMPLING AND ANALYSIS OF FUEL GASES

1959

British Standards Institution, London, England  
British Standard 3156

The standard describes only well established methods, and applies chiefly to gases from coal, coke or oil. The standard is divided into sections on sampling, general analysis, and special determinations.

972. THE LONG-WAVE INFRARED SPECTRUM OF  $H_2O$  VAPORS AND THE ABSORPTION OF ATMOSPHERIC AIR IN THE 20–2500 $\mu$  REGION (500–4 cm $^{-1}$ )

Yaroslavskii, N. G., Stanevich, A. E.

*Optika i Spektroskopiya*, v. 7, pp. 626–631, 1959

973. EFFECT OF PRESSURE ON THE VISCOSITY OF  $N_2$ – $CO_2$  MIXTURES

Kestin, J., Leidenfrost, W.

*Physica*, v. 25, pp. 525–536, 1959

Accurate viscosity measurements are made at 20°C, 1 to 21 atm pressure. An oscillating-disk viscometer was used. Measured pressures during filling were used to determine the composition of the mixture.

974. GAS ANALYSIS

Hobbs, A. P.

*Spisy Přírodovedecké Fakulty University v Brne*,  
no. 400, pp. 54R–63R, 1959

975. APPARATUS FOR CONTINUOUS CONDUCTOMETRIC DETERMINATION OF SMALL QUANTITIES OF CO IN GASES

Waclawik, J.

*Chemia Analityczna*, v. 4, pp. 337–341, 1959  
(in Polish with English summary)

The change in conductivity of NaOH after absorption of CO<sub>2</sub>, produced by oxidizing of CO with I<sub>2</sub>O<sub>5</sub>, gives an indication of the quantity of CO present in the gas.

976. ATMOSPHERIC ABSORPTIONS IN THE NEAR INFRARED AT HIGH ALTITUDES

Murcray, D. G., Brooks, J. N., Murcray, F. H., Williams, W. J.

*Optical Society of America, Journal of the*, v. 50, no. 2, pp. 107–112, February 1960

977. OXYGEN INDICATOR

Vollmer, J.

March 29, 1960

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,930,970 (assigned to Minneapolis-Honeywell Regulator Co.)

An apparatus is claimed which uses the variation of reluctance of a magnetic circuit with O-bearing atmosphere to determine the oxygen present. A permanent magnet is used as a source of constant magnetomotive force for supplying flux.

978. AUTOMATIC RECORDING INSTRUMENTS AS APPLIED TO AIR ANALYSIS

Giever, P. M., Cook, W. A.

*AMA Archives of Industrial Health*, v. 21, pp. 233–249, March 1960

A review with 23 references is presented.

979. DESIGN OF A SINGLE ELECTRODE CAPACITOR FOR USE WITH MOISTURE METERS AND SIMILAR APPARATUS

Leach, D. F., Neilson, J. M. M.

*Journal of Scientific Instruments*, v. 37, pp. 77–80, March 1960

980. BALANCED IONIZATION CHAMBERS OFFER SENSITIVE GAS ANALYSIS

Maley, L. E.

*Nucleonics*, v. 18, no. 3, pp. 126, 128, March 1960

Contaminants in gases can be detected in parts-per-billion range by making them into smoke particles and passing the particles into an ionization chamber. Such particles reduce ion current by acting as recombination centers. An electrical circuit compares the conductance of gas in this chamber with that in a control chamber.

981. SENSITIVE THERMAL CONDUCTIVITY GAS ANALYZER

Purcell, J. R., Keeler, R. N.

*Review of Scientific Instruments*, v. 31, pp. 304–306, March 1960

982. REVIEW OF FUNDAMENTAL DEVELOPMENTS IN GAS ANALYSIS

Hobbs, A. P.

*Analytical Chemistry*, v. 32, no. 5, pp. 54R–63R, April 1960

983. ELECTROCHEMICAL DETECTOR FOR OXYGEN DEFICIENCY IN THE ATMOSPHERE

Jacobson, M. G., DeLuca, F. J.

June 7, 1960

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,939,827 (assigned to Mine Safety Appliances Co.)

The square root of the oxygen concentration of the gas mixture at the cathode of a Fery-type cell is proportional to the current in a primary cell-resistor circuit, and can be read directly from a square-root scale on the meter.

984. COULOMETRIC ANALYZER FOR TRACE QUANTITIES OF OXYGEN

Keidel, F. A.

*Industrial and Engineering Chemistry*, v. 52, pp. 490–493, June 1960

985. DETECTION OF TRACES OF OXYGEN IN GASES

Davis, P. S.

*Metallurgia*, v. 62, no. 369, pp. 49–50, July 1960

The simple method described is based on color change which occurs when leuco-methylene blue is oxidized to methylene blue. Suggested uses of this method are in argon arc welding and glove box work where oxygen must be eliminated. A bibliography is included. (EI, 1960)

986. TRACE MONITORING IN GASES USING  
GALVANIC SYSTEMS

Hersch, P. A.

*Analytical Chemistry*, v. 32, pp. 1030–1034,  
July 1960

987. GALVANIC CELL FOR DETERMINING  
OXYGEN IN GASES CONTAINING CARBON  
DIOXIDE

Koyama, K.

*Analytical Chemistry*, v. 32, pp. 1053–1054,  
July 1960

988. SAMPLING AND EXAMINING BLENDS

Fischer, J. J.

*Chemical Engineer*, v. 67, pp. 119–120,  
August 8, 1960

989. REMOTE-HANDLING AND ANALYTICAL  
TECHNIQUES USED IN THE PROCESSING  
OF SAMPLES FROM H.T.G.C. LOOP  
IRRADIATIONS

Brown, P. E., Flowers, R. H., Lupton, D. F. M.  
October 1960

United Kingdom Atomic Energy Authority,  
Research Group, Atomic Energy Research  
Establishment, Harwell, Berks, England  
AERE-R-3252

Details are given of a high level radiochemical cell which was in use for over a year without presenting any major difficulties. Some useful devices and techniques are described in connection with the radiochemical analysis of multi-curie level samples from H.T.G.C. loop experiments. (NSA, 1961, #14,369)

990. DESIGN OF SERIES PULSE COLUMNS  
PILOT PLANTS FOR LIQUID-LIQUID  
EXTRACTION. III. CALCULATIONS AND  
PRACTICAL REALIZATION OF A PLANT  
WITH REMOTE CONTROL AND  
RADIATION SHIELDING

Salvetti, F. L., Santoli, S.

October 1960

Comitato Nazionale per l'Energia Nucleare,  
Ispra, Italy  
CNEN-3

The design is discussed of a series pulse columns pilot plant with remote control and radiation shielding. The

project includes the choice of the remote control units, of the electrical setup, and the installation in a hot cell. Pressure drop analysis through a series connected columns plant is made.

991. DEVELOPMENT OF AN INEXPENSIVE,  
REMOTE SAMPLE-TRANSFER DEVICE

Bingham, C. D., Janeves, D.

November 3, 1960

North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.  
NAA-SR-Memo-5834

A simple, low-cost device for remote transfer of radioactive samples in a hot cell or shielded facility was designed and tested under hot-cell conditions. The device consists of a small (7.5 w) Bodine motor which, by means of a friction drive, extends and retracts a rigid-tape Yo-Yo. The Yo-Yo tape is attached to the cap of a cutaway, 4-oz polyethylene bottle which serves as the sample carriage. The carriage travels inside a flexible, plastic-covered tube called "elephant trunk." (NSA, 1961, #19,491)

992. CONTINUOUS DETECTION AND  
QUANTITATIVE MEASURING OF SMALL  
AMOUNTS OF OXYGEN IN STREAMING  
GASES

Spracklen, S. B., Campbell, D. N., Fellows, C. G.  
November 3, 1960

U.S. Department of Commerce, Washington, D.C.  
German Patent, 1,092,236 (assigned to Union  
Carbide Corp.)

Claim is made of an electrolytic cell capable of determining  $10^{-6}\%$  O.

993. MICRODETERMINATION OF NITROGEN  
IN ROCKS AND SILICATE MINERALS BY  
SEALED TUBE DIGESTION

Stevenson, F. J.

*Analytical Chemistry*, v. 32, pp. 1704–1706,  
November 1960

994. MICRODETERMINATION OF CARBON AND  
HYDROGEN BY A RAPID AUTO-  
MATIC PROCEDURE

Dorfman, L., Robertson, G. I.

*Analytical Chemistry*, v. 32, p. 1721,  
November 1960

**995. IONIZATION DETECTORS FOR GAS CHROMATOGRAPHY**

Stirling, P. H., Ho, H.

*Industrial and Engineering Chemistry*, v. 52, no. 11, pp. 61A-62A, 64A, November 1960

By using "tritium foil" in a small argon detector, it is possible to obtain responses to  $H_2$ ,  $N_2$ ,  $O_2$ ,  $CO_2$ ,  $CO$ ,  $(CN)_2$ ,  $CH_4$ ,  $C_2H_2$ ,  $C_2H_4$ ,  $H_2S$ ,  $NO_2$ ,  $N_2O$ , and  $CH_3Cl$ . Characteristics of other available ionization detectors are discussed.

**996. NEW GAS ANALYSER FOR CONTINUOUS DETERMINATION AND RECORDING OF THE PERCENT CONTENT OF CARBON DIOXIDE IN EXHALED AIR (TYPE GUF-1)**

Abdrakhmanov, M. I., Trofimovskii, M. R.

*Kazanskii Meditsinskii Zhurnal*, no. 3, pp. 91-93, 1960

A portable apparatus is described; optical density changes in an indicator solution with passage of  $CO_2$  are detected by a photocolorimetric method utilizing two photocells.

**997. COLLECTION OF SAMPLES OF NITROGEN DIOXIDE**

Alekseeva, M. V.

*Gigiena i Sanitariya*, v. 25, no. 6, pp. 50-51, 1960

Collection of  $NO_2$  by aspiration through chemical solutions compares unfavorably with collection in evacuated bottles. Passing 6-10 volumes of contaminated air through a gas pipet at low flow rate is found to give high results.

**998. CHEMICAL AND ELECTROCHEMICAL MEASUREMENT OF THE CONCENTRATION OF ATMOSPHERIC OZONE**

Britaev, A. S.

*Trudy Tsentralnoi Aerologicheskoi Observatorii*, no. 37, pp. 13-23, 1960

(See also *Referativnyi Zhurnal, Khimiya*, 1961, #16D113)

Oxidation by  $O_3$  of iodide solutions, e.g., KI solution, liberates I and increases the pH. For colorimetry,  $O_3$ -containing air is passed through an iodide solution containing an indicator until a color change occurs. A special spectrophotometer is suggested for color measurement. Electrochemical methods seem to be more accurate than colorimetric methods. Equipment to determine optimum reactions and measurement conditions is described. A

compensation method at frequency 1.6-2 kc seems best for measuring conductivity of a KI solution. Results are given for atmospheric  $O_3$  at ground level.

**999. APPARATUS FOR THE MEASUREMENT OF LIGHT SCATTERING IN LIQUIDS.**

**MEASUREMENT OF THE RAYLEIGH FACTOR OF BENZENE AND SOME OTHER PURE LIQUIDS**

Coumou, D. J.

*Journal of Colloid Science*, v. 15, pp. 408-417, 1960

A photometer measures the light scattered in a liquid sample. Light scattering with a standard liquid is used as a control, and correction is made for differences in volume and extent of the solid angle.

**1,000. DEVELOPMENT OF A FREEZE-OUT TECHNIQUE AND CONSTANT SAMPLING RATE FOR THE PORTABLE UNI-JET SAMPLER**

Linch, A. L., Charsha, H. G.

*American Industrial Hygiene Association Journal*, v. 4, pp. 325-329, 1960

An aspirator draws air mixtures through a chilled midget impinger. In mixtures containing 1-5 ppm of  $CS_2$  or  $PhNO_2$ ,  $CS_2$  can be collected at  $-321^{\circ}F$  with 85-90% efficiency, and  $PhNO_2$  at  $-116^{\circ}F$  with 90-95% efficiency. Low temperatures are obtained with Freon-12, solid  $CO_2$ , and liquid N.

**1,001. A DIFFERENTIAL OXYGEN ANALYZER**

Linderstroem-Lang, C. U.

*Acta Chemica Scandinavica*, v. 14, pp. 1031-1036, 1960 (in English)

Using the absorption of O by pyrogallol as a basis, a method was developed to ascertain very small differences in O content of air samples.

**1,002. AUTOMATIC APPARATUS FOR DETERMINATION OF TRACES OF OXYGEN IN GASES**

Pierrain, J.

*Chimie Analytique*, v. 42, pp. 78-82, 1960

Photometric measurement of  $CuCl$ , formed in absorption of O by a  $CuCl$  solution, is used to determine O (30-150 ppm O in N).  $C_2H_2$  must be absent; small amounts of  $C_2H_4$ , H and CO are immaterial.

1,003. AUTOMATIC ASPIRATOR FOR SAMPLING ATMOSPHERIC AIR IN A 24-HOUR PERIOD

Pinigin, M. A.

*Predelno Dopustimye Kontsentratsii*

*Atmosfernykh Zagryaznenii*, no. 4,

pp. 143–149, 1960

1,004. A UNIQUE THERMAL CONDUCTIVITY GAS ANALYZER

Purcell, J. R., Draper, J. W., Weitzel, D. H.

In "Proceedings of the 1957 Cryogenic Engineering Conference," v. 3, pp. 191–195, Plenum Press, Inc., New York, N. Y., 1960

(Paper D-4, presented at National Bureau of Standards Conference, Boulder, Colo., August 19–21, 1957)

The cell is excited by 60-cycle ac current. If used for hydrogen impurity analysis, the unit can have a range of as little as 200 ppm of nitrogen in hydrogen for full scale deflection, and 700 ppm deuterium in hydrogen. Time required to complete a reading is about 30 sec.

1,005. PROCEDURES FOR DETERMINATION OF HARMFUL SUBSTANCES IN THE AIR OF INDUSTRIAL ESTABLISHMENTS USING RYKHTER'S UNIVERSAL ABSORBER

Rykhter, E. V., Shlygina, N. V., Kobyakina, E. I. *Sbornik Nauchnyi Prakt. Rabot. Permskii Oblastnoi Sanitarnyi-Epidemol. Stantsii*,

no. 3, pp. 43–47, 1960

(See also *Referativnyi Zhurnal Khimiya*, 1961, # 141424)

A number of gases can be determined by turbidimetry, colorimetry, etc., after use of Rykhter's absorber. Procedures are detailed.

1,006. MODIFIED NO<sub>2</sub> REAGENT FOR RECORDING AIR ANALYZERS

Saltzman, B. E.

*Analytical Chemistry*, v. 32, pp. 135–136, 1960

Synthesis is given of a superior reagent for development of color within 1–4 min after sampling.

1,007. A RAPID ANALYZER EA-0201

Skvortsov, N. N.

*Gazovaya Promyshlennost*, v. 5, no. 2,

pp. 28–30, 1960

The CO<sub>2</sub> and NO<sub>2</sub> contents of air are determined by means of an absorber train that includes a tube containing color indicators sensitive to contact with these gases.

1,008. GAS ANALYZER MN-5106

*Gazovaya Promyshlennost*, v. 5, no. 2,

pp. 30–32, 1960

A schematic drawing and a wiring diagram illustrate the design of an automatic system for determining O and other components of the flue gases of powerplants.

1,009. SAMPLING SYSTEM

Hannaford, B. A., Rosenberg, R., Segaser, C. L., Terry, C. L.

January 17, 1961

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,968,183 (assigned to U.S. Atomic Energy Commission)

An apparatus is described for the batch sampling of radioactive liquids such as slurries from a system by remote control, while providing shielding for protection of operating personnel from the harmful effects of radiation. (NSA, 1961, #7385)

1,010. DETERMINATION OF THE C<sup>14</sup> ACTIVITY IN SLIGHT QUANTITIES OF LOW-BOILING LIQUIDS

Schweers, W.

*Atompraxis*, v. 7, pp. 1–3, January 1961  
(in German)

For determining the C<sup>14</sup> activity in small amounts of low-boiling liquids, it is advantageous to use suitably constructed measurement bowls in connection with a flow counter. These bowls can be closed with a lid containing a thin "window." With this method, activity in a few milligrams of substance can be determined within an accuracy of ±3%. (NSA, 1961, #14,230)

1,011. QUANTITATIVE DETERMINATION OF LOW ATOMIC NUMBER ELEMENTS USING INTENSITY RATIO OF COHERENT TO INCOHERENT SCATTERING OF X-RAYS; DETERMINATION OF HYDROGEN AND CARBON

Dwiggins, C. W., Jr.

*Analytical Chemistry*, v. 33, pp. 67–70, January 1961

- 1,012. USE OF FOUR-ELECTRODE CONDUCTOMETRY FOR THE AUTOMATIC DETERMINATION OF CARBON DIOXIDE AND AMMONIA IN CONCENTRATED SCRUBBING WATER OF COKE OVEN GAS  
Barendrecht, E., Janssen, N. G. L. M.  
*Analytical Chemistry*, v. 33, pp. 199–203,  
February 1961

- 1,013. PROCEDURE FOR SAMPLING AND ANALYSIS FOR HYDROGEN SULFIDE IN KRAFT MILL STACK GASES  
Murray, F. E., Rayne, H. B.  
*Tappi*, v. 44, pp. 219–221, March 1961

- 1,014. SUCCESSFUL SAMPLING: SYSTEMS APPROACH SIMPLIFIES ANALYZER-SAMPLE HANDLING  
Stirling, P. H., Ho, H.  
*Industrial and Engineering Chemistry*, v. 53,  
Supplement 57A–59A, 62A, March 1961

- 1,015. MAGNETIC WIND DETECTS OXYGEN FRACTIONS  
*Machine Design*, v. 33, p. 160, April 13, 1961

- 1,016. VAPOR DETECTOR BASED ON CHANGES IN DIELECTRIC CONSTANTS  
Winefordner, J. D., Steinbrecher, D., Lear, W. E.  
*Analytical Chemistry*, v. 33, pp. 515–521,  
April 1961

A variable capacitor mounted in a special cell, which allows gas to flow between the plates, is used. The difference frequency between oscillators is adjusted to zero for the pure carrier gas, and a difference frequency produced by an impurity is measured. The difference frequency is proportional to impurity concentration.

- 1,017. ABSOLUTE METHOD OF TURBIDIMETRIC ANALYSIS  
Meehan, E. J., Beattie, W. H.  
*Analytical Chemistry*, v. 33, pp. 632–635,  
April 1961

- 1,018. AUTOMATIC DEVICE FOR TAKING SAMPLES OF RADIOACTIVE SOLUTIONS  
May 31, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 869,249 (assigned to  
Commissariat à l'Energie Atomique)

An automatic device for taking samples of radioactive solutions is described. The device consists of a sample bottle, a conduit feeding the bottle, means controllable by a single action to place the solution under vacuum, and an electropneumatic motor system consisting of a liquid switch which makes use of the contact between the radioactive solution and the feeding conduit. The vacuum means causes the solution to come into contact with the feeding conduit and to start to penetrate the feeding conduit. The system further comprises a vacuum valve and an atmospheric valve; the contact closing the vacuum valve opens the atmospheric valve which causes separation of the body of the solution from the fraction of the solution which has penetrated the feeding conduit. Operation of the two valves is determined in such a way that the separation takes place at a given moment to collect the desired quantity of radioactive solution in the bottle. A security system which comes into operation if the device does not function properly is also described along with the protective enclosure. (NSA, 1961, #20925)

- 1,019. GAS SAMPLING VALVES MEASURE SCAVENGING EFFICIENCY [ABSTRACT]  
Asanuma, T., Yanagihara, S.  
*SAE Journal*, v. 69, p. 101, May 1961

- 1,020. TWO ELECTRICALLY-OPERATED TITRANT VALVES  
Stock, J. T., Fill, M.A.  
*Laboratory Practice*, pp. 302–304, May 1961

The electrically operated burette or titrant valves in which compression of a flexible tube controls the flow are described. Both are designed to operate on 4- to 6-v dc supply and have built-in controls for wide adjustment of the rate of titrant delivery. In addition, the response of the second of the valves is designed quite sensitive to the operating voltage in order that remote control of the flow rate is possible. (NSA, 1961, #23433)

- 1,021. OXYGEN GAUGE  
Weissbart, J., Ruka, R.  
*Review of Scientific Instruments*,  
v. 32, pp. 593–595, May 1961

- 1,022. AUTOMATIC MOISTURE ANALYZERS MONITOR GAS AND LIQUID STREAMS  
*Chemical Engineering*, v. 68, p. 70, June 26, 1961

- 1,023. GAS-TRACER METHOD FOR STUDY AND PULSATING-FLOW MEASUREMENT  
Kemp, J. F.  
*ASME, Transactions of the, Series D—Journal of Basic Engineering*, v. 83, pp. 305–311, June 1961
- 1,024. MAGNETIC WINDS; PARAMAGNETIC OXYGEN ANALYZERS ARE FINDING WIDER APPLICATION  
Stirling, P. H., Ho, H.  
*Industrial and Engineering Chemistry*, v. 53, pp. 62A–64A, 67A, June 1961
- 1,025. AUTOMATIC SAMPLER PROVES ACCURACY  
Schonewald, G. S.  
*Oil and Gas Journal*, v. 59, pp. 182, 184, 186, July 31, 1961
- 1,026. MODIFIED CHROMATOGRAPH TO RECORD HELIUM CONTENT OF GAS STREAMS  
Klingman, C. L.  
*Review of Scientific Instruments*, v. 32, pp. 822–824, July 1961
- 1,027. VARIATION OF ELECTRICAL RESISTANCE OF A POLYMER AS A FUNCTION OF THE EXTENT AND NATURE OF SORBED WATER  
Kawasaki, K.  
*Journal of Colloid Science*, v. 16, pp. 405–410, August 1961
- 1,028. GAS DETECTOR; OLFACTRON  
*Electronic Industries*, v. 20, p. 222, August 1961
- 1,029. DETECTOR OF CARBON MONOXIDE  
*Engineering*, v. 192, p. 279, September 1, 1961
- 1,030. FLUORESCENT TUBE ILLUMINATES TURBIDITY PROBLEM; SIMPLE TURBIDITY METER MADE FROM A GLASS PIPE AND A FLUORESCENT LIGHT BULB  
Symons, E. F.  
*Chemical Engineering*, v. 68, p. 150, September 4, 1961
- 1,031. SPECTROPHOTOMETRIC METHOD FOR THE DETERMINATION OF MOISTURE AND ACTIVE HYDROGEN  
Mungall, T. G., Mitchen, J. H.  
*Analytical Chemistry*, v. 33, pp. 1330–1331, September 1961
- 1,032. CHEMIST IN BOX  
Stirling, P. H., Ho, H.  
*Industrial and Engineering Chemistry*, v. 53, no. 9, pp. 59A–61A, September 1961
- Automatic installations include the sample handling system, sample injection system, dilution stage, dispensing systems, end-point indicator, readout system, etc. Characteristics of titrators, colorimeters, and laboratory autotitration are given.
- 1,033. COMPARISON OF INSTRUMENTAL METHODS OF ANALYSIS FOR ODORANTS AND OTHER SULFUR COMPOUNDS IN NATURAL GAS  
Tarman, P. B., Andreen, B. H., Kniebes, D. V.  
*Gas*, v. 37, pp. 97–105, September 1961
- 1,034. ELECTRONIC NOSE DETECTS TOXIC VAPORS  
*Safety Maintenance and Production*, v. 122, pp. 42–45, September 1961
- 1,035. SIMPLE DEVICE FOR CONTINUOUS CO<sub>2</sub> INDICATION  
Gries, W. H.  
*Chemical Engineering*, v. 68, p. 130, October 30, 1961
- Two manometers, in series, and an absorption chamber give a continuous analysis of gases.
- 1,036. DIPPING CHROMATOGRAPH TUBE COLLECTS MICROGRAM SAMPLES  
Palmer, R. C.  
*Control Engineering*, v. 8, p. 121, October 1961
- 1,037. DETERMINING DENSITY  
Stirling, P. H., Ho, H.  
*Industrial and Engineering Chemistry*, v. 53, no. 10, pp. 48A–50A, October 1961

Applications of gas density gages include process stream analysis, mass flow measurement, chromatography and hazardous atmosphere monitoring. Nuclear and weighing type densitometers are currently used for difficult applications such as slurries or suspensions. Gas density gages utilize differing physical principles including buoyancy, sonic velocity, and centrifugal acceleration.

- 1,038. CONTINUOUS SEPARATION OF GASEOUS MIXTURES BY THERMAL GRAVITATIONAL DIFFUSION  
Frame, H. D., Jr., Kuszewski, J. R.,  
Binder, J. F., Strain, H. H.  
*Analytical Chemistry*, v. 33, pp. 1741-1745,  
November 1961

Temperature gradients from 175 to 430°C were produced in a diffusion cell by electrically heating one vertical wall and water cooling the other. Chambers of the following three constructions were tried: (1) without internal structure, (2) with vertical quartz fiber packing, and (3) with vertical porous barriers. Exit from the chamber was through three vents. Results are presented for He-N mixtures, N-Ar, Ne<sup>20</sup>-Ne<sup>22</sup>, and He-N-Ar.

- 1,039. DETERMINATION OF OXYGEN BY THE INERT GAS DIFFUSION METHOD USING GRAPHITE CAPSULES  
Beck, E. J., Clark, F. E.  
*Analytical Chemistry*, v. 33, pp. 1767-1770,  
November 1961

- 1,040. IONIZATION GAUGE CALIBRATION FOR WATER VAPOR  
Futch, A. H., Jr.  
*Review of Scientific Instruments*, v. 32,  
pp. 1263-1264, November 1961

- 1,041. GAS ANALYSIS BY THERMAL CONDUCTIVITY  
McFadden, J. L.  
*Instruments and Control Systems*, v. 34,  
pp. 2055-2057, November 1961

- 1,042. REAGENT AND INDICATOR IN TEST TUBES FOR DETECTION AND DETERMINATION OF CARBON MONOXIDE IN AIR AND IN OTHER GASES  
Heidrich, H.  
December 28, 1961

U.S. Department of Commerce, Washington, D.C.  
German Patent 1,120,768 (assigned to  
Auergesellschaft G.m.b.H.)

Concentrations of CO  $\geq$  0.0005-0.3 volume % can be determined by passing the gas through a mixture of two silica gels containing oleum and I<sub>2</sub>O<sub>5</sub>, and noting the appearance of a characteristic green color.

- 1,043. AUTOMATIC CONTROL OF DISTILLATION COLUMNS  
Lupfer, D. E., Oglesby, M. W.  
*Industrial and Engineering Chemistry*,  
v. 53, pp. 963-969, December 1961  
(Also available in *Oil and Gas Journal*,  
v. 60, pp. 111-112, March 5, 1962)

- 1,044. EFFECT OF RATE OF SAMPLING ON THE TRANSIENT BEHAVIOR OF THERMOGRAVITATIONAL THERMAL DIFFUSION COLUMNS WITHOUT RESERVOIRS  
Vichare, G. G., Powers, J. E.  
*AIChE Journal*, v. 7, pp. 650-652, December 1961

- 1,045. SU DI UN'ATTREZZATURA MOBILE PER IL PRELIEVO DI CAMPIONI D'ARIA (MOBILE AIR SAMPLING EQUIPMENT)  
Barbero, P.  
*Rassegna di medicina industriale e Igiene del Lavoro*, v. 30, no. 2, pp. 110-111, 1961  
(in Italian with English summary)

A description is given of mobile air sampling equipment which has particular endurance characteristics and is suitable to zones with difficult roads.

- 1,046. A RELIABLE LOW COST INSTRUMENT FOR DETERMINING ATMOSPHERIC OXIDANT LEVELS  
Doughty, R. V., Erisman, D. O.  
*Air Pollution Control Association, Journal of the*,  
v. 11, pp. 428-430, 1961

The mechanical effects of ozone attack on rubber is utilized in this instrument. A rubber strip, half shielded from and half exposed to O<sub>3</sub>, is stretched over a pulley and attached to an indicating needle. Ozone attack causes a mechanical movement indicated by the needle.

- 1,047. DEVICE FOR DETERMINATION OF CARBON DIOXIDE IN THE ATMOSPHERE  
Lyutsarev, S. V.  
*Trudy Institute Okeanologii, Akademiya Nauk SSSR*, v. 47, pp. 199–202, 1961

A portable apparatus based upon complete absorption of CO<sub>2</sub> is usable for determining CO<sub>2</sub> in as little as 50 cc of air with error of 2%.

- 1,048. AN INSTRUMENT FOR CONTINUOUS ANALYSIS OF ATMOSPHERIC OZONE  
McCully, C. R., Roesler, J. F., Gordon, E. S., Van Scyoc, J. N., Carrigan, R. A.  
*IRE Transactions on Instrumentation*, v. I-10, pp. 89–93, 1961

The O<sub>3</sub> concentration is determined by cycling air heated by O<sub>3</sub> decomposition and unchanged air alternately over uncoated thermistors, and taking low-frequency ac signals from a dc-energized Wheatstone bridge. Noise due to lack of symmetry in the cycling system and sorption transients limit the sensitivity. The basic parameters, circuitry, the cycling rotor, and the detection cell are described. The cycling rotor is made of precision-built concentric cylinders, half coated with an O<sub>3</sub> decomposition catalyst. H<sub>2</sub>O interferes because of an intermediate H<sub>2</sub>O<sub>2</sub> reaction. The sensitivity is 7  $\mu$ v/ppm, or approximately 10% theory, and concentrations of 0.1–10 ppm O<sub>3</sub> were measured with a precision of 10%. (CA, 1962, #2682i)

- 1,049. COMPLETELY AUTOMATIC, COULOMETRIC TITRATION APPARATUS FOR PROCESS USE; DETERMINATION OF SULFUR DIOXIDE IN GASES WITH CONCENTRATIONS RANGING FROM 0.1 TO 100 PERCENT BY VOLUME  
Barendrecht, E., Martens, W.  
*Analytical Chemistry*, v. 34, pp. 138–142, January 1962

- 1,050. FUNDAMENTALS OF RESERVOIR FLUIDS; SAMPLING AND TESTING OIL RESERVOIR SAMPLES  
Clark, N. J.  
*Journal of Petroleum Technology*, v. 14, pp. 12–16, January 1962

- 1,051. ELECTROCHEMICAL DEVICE FOR MEASURING OXYGEN  
Neville, J. R.  
*Review of Scientific Instruments*, v. 33, pp. 51–55, January 1962
- 1,052. LOCATING WATER MAIN LEAKS WITH NITROUS OXIDE TRACER  
*Water Works Engineering*, v. 115, pp. 64–65, January 1962

- 1,053. AUTOMATIC SAMPLING DEVICE HAS NO MOVING PARTS  
Yates, W. H.  
*Chemical Engineering*, v. 69, pp. 142, 144, February 19, 1962

- 1,054. RAPID METHOD FOR THE DIRECT DETERMINATION OF ELEMENTAL OXYGEN BY ACTIVATION WITH FAST NEUTRONS  
Veal, D. J., Cook, C. F.  
*Analytical Chemistry*, v. 34, pp. 178–184, February 1962

- 1,055. DETERMINATION OF OXYGEN BY ACTIVATION ANALYSIS WITH FAST NEUTRONS USING A LOW-COST PORTABLE NEUTRON GENERATOR  
Steele, E. L., Meinke, W. W.  
*Analytical Chemistry*, v. 34, pp. 185–187, February 1962

- 1,056. DETERMINATION OF MONOETHANOL-AMINE AND AMMONIA IN AIR  
Williams, D. D., Miller, R. R.  
*Analytical Chemistry*, v. 34, pp. 225–227, February 1962

- 1,057. DEVICE FOR METERING OXYGEN  
Eggers, R.  
March 1, 1962  
U.S. Department of Commerce, Washington, D.C.  
German Patent 1,124,735 (assigned to Licentia Patent-Verwaltungs-G.m.b.H.)

The change in magnetic resistance with O content of a gas is used for oxygen determination. By applying the flux to both the test gas and a control gas at the same time, other variables such as temperature do not interfere.

1,058. DETECTING AMMONIA AND  
AMINE VAPOR

Williams, D. D.

March 13, 1962

U.S. Department of Commerce, Washington, D.C.

U. S. Patent 3,025,142 (assigned to U. S.

Department of the Navy)

A characteristic blue color is produced by passing NH<sub>3</sub> and amine vapors through ninhydrin-silica gel and heating. The concentration is directly proportional to bandwidth. Concentrations less than 1 ppm may be determined.

1,059. NATIONAL AIR SAMPLING NETWORK  
MEASUREMENT OF SO<sub>2</sub> AND NO<sub>2</sub>

Perry, W. H., Tabor, E. C.

*Archives of Environmental Health*, v. 4,

pp. 254–264, March 1962

1,060. POLAROGRAPHIC DETERMINATION OF  
METHYL BROMIDE, ETHYLENE  
DIBROMIDE, ACRYLONITRILE,  
CHLOROPICRIN, AND CARBON  
TETRACHLORIDE IN AIR

Berck, B.

*Journal of Agriculture and Food Chemistry*,  
v. 10, pp. 158–162, March 1962

1,061. FUNDAMENTALS OF RESERVOIR  
FLUIDS; SAMPLING AND TESTING GAS  
RESERVOIR SAMPLES

Clark, N. J.

*Journal of Petroleum Technology*, v. 14,  
pp. 266–272, March 1962

1,062. DETERMINATION OF OXYGEN IN ZINC,  
CADMIUM, AND MAGNESIUM BY  
CARBON-REDUCTION IN AN INERT  
GAS STREAM

Holt, B. D., Goodspeed, H. T.

*Analytical Chemistry*, v. 34, pp. 374–378,  
March 1962

1,063. MICRODETERMINATION OF CARBON  
AND HYDROGEN USING NONDISPERSIVE  
INFRARED AND THERMAL  
CONDUCTIVITY ANALYSIS

Kuck, J. A., Berry, J. W., Andreatch, A. J.,  
Lentz, P. A.

*Analytical Chemistry*, v. 34, pp. 403–407,  
March 1962

Carbon is determined as CO<sub>2</sub> with a nondispersive, infrared gas analyzer, and hydrogen is determined as the gas with a thermistor-type thermal conductivity cell. This method is applicable to sample weights in the range of 4.0 to 0.5 mg and is operable with as little as 200 µg of material.

1,064. NEW METHOD FOR THE  
ULTRAMICRODETERMINATION OF  
NITROGEN

Hozumi, K., Kirsten, W. J.

*Analytical Chemistry*, v. 34, pp. 434–435,  
March 1962

1,065. APPLICATION FOR GAS  
CHROMATOGRAPHY TO THE ANALYSES  
OF ORGANICS, WATER, AND ADSORBED  
GASES IN THE LUNAR CRUST

Oyama, V. I., Vango, S. P., Wilson, E. M.  
*ARS Journal*, v. 32, pp. 354–360, March 1962

The data obtainable by controlled heating of biogenic material with mineral mixtures are presented. The application of this technique to a gas chromatograph apparatus being fabricated is discussed.

1,066. NATIONAL AIR SAMPLING NETWORK  
MEASUREMENT OF SO<sub>2</sub> AND NO<sub>2</sub>

Perry, W. H., Tabor, E. C.

*Archives of Environmental Health*,  
v. 4, pp. 254–264, March 1962

1,067. DETERMINING THE CAUSE OF DEATH  
OF VEGETATION BY ANALYSIS OF  
SOIL GASES

Braverman, M. M., Ettinger, I., Jacobs, M. B.  
*Gas Age*, v. 129, pp. 23–26, April 26, 1962

1,068. DEVELOPMENT OF THE SONIC GAS  
ANALYSER

Haswell, R., Reid, A. M.

*Industrial Chemist and Chemical Manufacturer*,  
v. 38, pp. 164–166, April 1962

1,069. REVIEW OF FUNDAMENTAL  
DEVELOPMENTS IN ANALYSIS

Hobbs, A. P.

*Analytical Chemistry*, v. 34, no. 5,  
pp. 91R–98R, April 1962

- 1,070. DETERMINATION OF OXYGEN UPTAKE RATE BY POLAROGRAPHIC METHOD  
Morgan, P. F., Bewtra, J. K.  
*Water Pollution Control Federation, Journal of the*, v. 34, pp. 363-375, April 1962

- 1,071. AUTOMATIC TITRATOR TESTS OIL SAMPLES CONTINUOUSLY  
Patient, D. A.  
*Control Engineering*, v. 9, pp. 143+, April 1962

- 1,072. PORTABLE OZONE RECORDER  
*Journal of the Franklin Institute*, v. 273, pp. 352-353, April 1962

- 1,073. SENSORS TO MEASURE OXYGEN LEVELS  
*Journal of the Franklin Institute*, v. 273, p. 349, April 1962

- 1,074. ABSORPTION BUBLER FOR THE MICRO-DETERMINATION OF GASES  
Kamphausen, H. A.  
*Chemistry & Industry*, p. 816, May 5, 1962

- 1,075. INSTRUMENT FOR ON-STREAM STRIPPING AND GAS CHROMATOGRAPHIC DETERMINATION OF DISSOLVED GASES IN LIQUIDS  
Williams, D. D., Miller, R. R.  
*Analytical Chemistry*, v. 34, pp. 657-659, May 1962

- 1,076. RAPID AUTOMATIC MICRODETERMINATION OF NITROGEN  
Dorfman, L., Oeckinghaus, R., Anderson, F.  
Robertson, G. I.  
*Analytical Chemistry*, v. 34, pp. 678-682, May 1962

Analyses can be completed in 6 to 15 min. Errors are considered.

- 1,077. SPECTROPHOTOMETRIC TITRATIONS OF CARBON DIOXIDE, BICARBONATE AND CARBONATE SOLUTIONS  
Underwood, A. L., Howe, L. H., III  
*Analytical Chemistry*, v. 34, pp. 692-694, May 1962

- 1,078. SIMPLE ATMOSPHERIC CARBON DIOXIDE ANALYZER  
Lodge, J. P., Jr., Frank, E. R., Ferguson, J.  
*Analytical Chemistry*, v. 34, pp. 702-704, May 1962

Fine marble chips are suspended in continually aerated distilled H<sub>2</sub>O, and the equilibrium pH is measured by an expanded-scale pH meter.

- 1,079. VACUUM FUSION-GAS CHROMATOGRAPHIC DETERMINATION OF OXYGEN AND NITROGEN IN METALS  
Lewis, L. L., Melnick, L. M.  
*Analytical Chemistry*, v. 34, pp. 868-869, June 1962

- 1,080. GAS ANALYSIS BY USE OF MICROWAVES  
Johansson, G.  
*Analytical Chemistry*, v. 34, pp. 914-916, July 1962

- 1,081. SPECTROPHOTOMETRIC DETERMINATION OF NITRIC OXIDE IN AUTO EXHAUST  
Nicksic, S. W., Harkins, J.  
*Analytical Chemistry*, v. 34, pp. 985-988, July 1962

- 1,082. KJELDAHL DETERMINATION OF NITROGEN WITHOUT DISTILLATION  
Hashmi, M. H., Ali E., Umar, M.  
*Analytical Chemistry*, v. 34, pp. 988-990, July 1962

- 1,083. ANALYSIS OF AIR POLLUTION MIXTURES; A STUDY OF BIOLOGICALLY EFFECTIVE COMPONENTS  
Estes, F. L.  
*Analytical Chemistry*, v. 34, pp. 998-1001, July 1962

- 1,084. EFFECT OF HYDRAZINE ON THE MICRODETERMINATION OF DISSOLVED OXYGEN  
Needleman, M.  
*Journal of Applied Chemistry*, v. 12, pp. 294-305, July 1962

- 1,085. GAS SAMPLER; AUTOMATIC MEASURING DEVICE FOR DETERMINING THE PURITY OF GASES  
*Food Technology*, v. 16, p. 32, July 1962

- 1,086. DISSOLVED OXYGEN MONITORING FOR STREAM POLLUTION CONTROL  
Dixon, W. S.  
*Public Works*, v. 93, pp. 93–94, August 1962

- 1,087. AN ELECTRICAL ANALYZER FOR CARBON DIOXIDE IN RESPIRATORY GASES  
Bernstein, L., Yoshimoto, C.  
*Journal of Applied Physiology*, v. 17, pp. 126–130, 1962

An analyzer is described, and the theory of thermal-conductivity-cell analyzers is discussed.

- 1,088. AUTOMATIC MICROCHEMICAL INVESTIGATION OF ATMOSPHERIC AIR. I. THE "RELATIVE CONDUCTIMETRIC" DETERMINATION OF CARBON DIOXIDE  
Malissa, H., Wagner, G.  
*Mikrochimica Acta*, pp. 332–339, 1962  
(in German)

The 7-min conductimeter compares favorably with the titration method.

- 1,089. MODERN CONCEPTS OF AIR SAMPLING AND PROBLEMS FOR THE FUTURE  
Schulte, H. F.  
*American Industrial Hygiene Association Journal*, v. 23, no. 1, pp. 20–25, 1962

Included are papers presented at a joint session of the American Industrial Hygiene Association and the American Conference of Government Industrial Hygienists in Detroit, Mich., on April 11, 1961.

## ADDITIONAL INSPECTION, TESTING, AND ANALYSIS TECHNIQUES

### 1,090. SEPARATION AND DETECTION OF ELEMENTS BY ELECTROLYSIS

Alimarin, I. P., Petrikova, M. N.

*Zhurnal Analitika Khimica*, v. 8, pp. 11-17, 1953

Microelectrolysis is discussed. Application is possible to volumes on the order of  $10^{-3}$  ml and quantities of substance on the order of  $10^{-6}$ - $10^{-8}$  g. The microelectrodes used are Pt or Hg. Examples are presented of Cu and V separation.

### 1,091. A REMOTE CONTROLLED QUARTZ-FIBER MICRO-BALANCE: DESIGN, CONSTRUCTION, AND CHARACTERISTICS

Olt, R. G., DuFour, H. R., Gray, M. I., Wright, J. H.

December 7, 1954

Monsanto Chemical Co., Mound Lab., Miamisburg, Ohio

Information Report, MLM-1022, AT 33-I-GEN-53 AD-75,674

Completely remote operation of an improved Kirk-Craig type of quartz-fiber microbalance is described. Weighings are performed within a vacuum-tight housing wherein the atmosphere may be controlled and duplicated. The reduction of health hazards associated with the measurement of radioactive samples, control of atmospheric effects on the samples, and increased speed and precision of weighing are some of the advantages gained from remote sample handling and from improvements in operating controls. The quality of the components of construction and the workmanship in the assembly of the balance are of paramount importance in developing a rugged, reliable instrument which is useful for routine mass determinations. (ASTIA)

### 1,092. SAMPLING PROBLEMS IN SPECTROGRAPHIC ANALYSIS [ABSTRACT]

Oldfield, J. H.

*Iron and Steel Institute, Journal of the*, v. 185, pp. 490-491, April 1957

### 1,093. A CONTINUOUSLY RECORDING MICROMETER-PROFILOMETER FOR HOT LABORATORY APPLICATIONS

Stratton, K.

In "Proceedings of the Sixth Hot Laboratories and Equipment Conference, Chicago, Ill., March 19-21, 1958," pp. 130-134 American Institute of Chemical Engineers, New York, N. Y.  
(Obtainable as TID-7556, U.S. Dept. of Commerce, Office of Technical Services, Washington, D. C.)

An instrument is described which provides a continuous record of thickness change or surface profile for irradiated plate and rod specimens. Two linear displacement transducers are oriented in an opposed position and the samples are moved between roller actuators at a preselected speed, providing suitable recorder magnification. Total dimension changes obtained in this manner are independent of sample warpage or bowing. Disconnecting one transducer provides a surface contour with high resolution of surface defects. Samples 6 in. high, 8 in. wide, and 16 in. long are accommodated. Routine accuracies of 0.5 to 0.1 mils can be obtained under normal hot cell operating conditions. (NSA, 1959, #14,356)

### 1,094. REMOTE METALLOGRAPHIC EQUIPMENT AND PRACTICES

Cain, F. M., Bingman, F. O.

In "Proceedings of the Sixth Hot Laboratories and Equipment Conference, Chicago, Ill., March 19-21, 1958," pp. 135-154 American Institute of Chemical Engineers, New York, N. Y.  
(Obtainable as TID-7556, U.S. Dept. of Commerce, Office of Technical Services, Washington, D. C.)

A review of equipment and practices used in the remote metallographic facility at Bettis is presented. The modifications of various pieces of equipment are outlined in addition to their operation and advantages. Deviations from normal operations or special techniques are discussed for specific operations. There are sections on the construction of the basic cell, the supporting equipment such as the liquid waste disposal system, design and

operation of a remote sectioning machine, mounting techniques, grinding and polishing procedures, etching equipment and techniques, transfer and storage facilities, photography, hardness testing, and operating techniques for specific materials as related to the problems encountered in processing radioactive materials. (NSA, 1959, #14,357)

**1,095. EQUIPMENT FOR THE MACHINING  
AND TENSILE TESTING OF IRRADIATED  
URANIUM**

Shaw, D., Hufton, W. G.

April 30, 1958

United Kingdom Atomic Energy Authority,  
Industrial Group, Windscale Works,  
Sellafield, Cumberland, England

IGR-TN/W-905

A small center lathe was set up for turning tensile test pieces from irradiated uranium fuel elements. A Hounsfield tensometer has also been modified for remote operation. The apparatus was commissioned and one tensile test carried out on irradiated uranium. In this instance the proof stress was increased from 25 to 34 ton/in.<sup>2</sup> and the elongation reduced from 4 to 0.3% compared with unirradiated uranium. (NSA, 1959, #199)

**1,096. A REMOTELY OPERATED  
POLAROGRAPHIC APPARATUS**

Jackson, C.

August 1958

United Kingdom Atomic Energy Authority,  
Atomic Energy Research Establishment,  
Harwell, Berks, England

AERE-ES/R-2491

Three simple pieces of apparatus are described which ease the problems of polarography on radioactive materials. The devices may be of use for other remotely operated assemblies. (NSA, 1959, # 161)

**1,097. REMOTE ANALYTICAL FACILITY  
OPERATIONAL EXPERIENCES**

Huff, G. A.

In "Proceedings of the Second Conference on Analytical Chemistry in Nuclear Reactor Technology. Part 2. Instrumentation, Remote Control Techniques, and Nucleonics, Gatlinburg, Tenn., September 29–October 1, 1958." pp. 55–64 U. S. Atomic Energy Commission, Division of Technical Information, Rockville, Md.

(Obtainable as TID-7568, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The benefits and operational experiences of the Remote Analytical Facility at the Idaho Chemical Processing Plant are described. The original remote laboratory is compared with the new Remote Analytical Facility described in *Analytical Chemistry*, v. 28, p. 1084 (1956). It is shown that simple remote handling techniques are at times overlooked in preference to those which are more complex. It is pointed out that the new facility adequately fills its need. Advantages afforded by the new facility are discussed. The time required for carrying out analyses by direct and by remote techniques are compared. A comparison is also made of the precisions which can be attained when remote handling and direct bench-top techniques are used in chemical analyses. (NSA, 1959, #14,250)

**1,098. REMOTELY OPERATED FILTER  
PHOTOMETER**

Kelley, M. T., Wagner, E. B., Maddox, W. L.,

Jones, H. C., Fisher, D. J.

*Analytical Chemistry*, v. 30, pp. 1711–1712,  
October 1958

Colorimetric analyses of radioactive samples are done remotely within cells in the High Radiation Level Analytical Facility. Manipulations of samples and instrument are done with a pair of master-slave manipulators. Only the compact sensing unit is within the cell. This separation of components reduces slave movements to a minimum, saves valuable cell space, simplifies maintenance problems, and was found to be reliable and stable. (NSA, 1959, #1302)

**1,099. A REMOTELY CONTROLLED  
DROP-WEIGHT TEST MACHINE FOR  
BRITTLE-FRACTURE STUDIES**

Steele, L. E., Hawthorne, J. R.

January 16, 1959

Naval Research Laboratory, Washington, D.C.  
NRL-5278

(See also "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7–9, 1959," pp. 232–238)

In order to study the effects of nuclear radiation on the notch-impact properties of large steel specimens, remotely controlled drop-weight test equipment has been designed for use in a hot-cell facility. The drop-weight

test has been used to define the control temperature below which steel structures may potentially initiate brittle fractures in the presence of sharp notches or flaws. The test is to be applied for the determination of embrittlement due to radiation. Irradiated specimens to be tested are thermally conditioned in insulated environmental chambers, then positioned on the machine where a free-falling weight delivers a fixed amount of energy to the specimen to determine the relative resistance to fracture. The weight is coupled electromagnetically and lifted by a remotely operated ratiomotor to a height which is predetermined by means of seven microswitches located at 1-ft intervals. All phases of this testing operation are accomplished remotely by pneumatic or electrical means, with the exception of specimen placement which is accomplished by use of the master-slave manipulators. (NSA, 1959, #3938)

**1,100. A REMOTELY OPERATED CHARPY TEST MACHINE FOR RADIOACTIVE SPECIMENS**

Hawthorne, J. R., Steele, L. E.

March 12, 1959

Naval Research Laboratory, Washington, D. C.  
NRL-5305

(See also "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 239-246)

Apparatus for the remote testing of standard Charpy V-notch specimens was developed for the NRL Metallurgy Division Hot-Cell Facility. Specimens of various steels for atomic-energy applications are tested in this facility after irradiation in materials testing reactors. With this apparatus, test temperatures within the range of -100° to 300°F can be attained. Heating and cooling are accomplished remotely by gas flow, thus eliminating the need for liquid temperature-control baths. Specimen temperature is measured continuously during the heating or cooling cycle by means of a thermocouple in contact with the specimen. Placement of the irradiated specimen in the test machine is accomplished automatically by pneumatic devices controlled by a synchronous programmer. With this system, approximately five seconds are required to test a specimen after it has been conditioned thermally. (NSA, 1959, #49,130)

**1,101. CREEP TEST FACILITY FOR IRRADIATED SAMPLES**

Stearns, R. F.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 207-212  
American Society of Mechanical Engineers, New York, N. Y.

A creep test facility has been developed to test irradiated samples with the same accuracy which can be obtained from nonirradiated samples. The facility provides for environmental temperatures up to 1200°F. Sample elongation is indicated directly by means of dial gages. The facility consists of a shielded cask containing a furnace, grips and load members, remote handling fixtures, and a temperature control system. Successful tests have been made. (NSA, 1962, #17,610)

**1,102. THE USE OF COMMERCIAL EQUIPMENT FOR ANALYTICAL CHEMISTRY BY REMOTE CONTROL**

McCown, J. J., Sovereign, W. R., Larsen, R. P.  
In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 219-226  
American Society of Mechanical Engineers, New York, N. Y.

Analytical operations, which will be used in the EBR-II Analytical Junior Cave Facility, have been tested in a full-scale cave mock-up. It has been found that all of the necessary operations can be performed using simple and in most cases commercially available equipment. A description of the operations and equipment is given. (NSA, 1959, #17,612)

**1,103. TECHNIQUES, EQUIPMENT AND METHODS OF OPERATION USED AT THE KAPL RADIOACTIVE MATERIALS LABORATORY REMOTE METALLOGRAPHY CELL**

Wemple, B. D.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 387-396  
American Society of Mechanical Engineers, New York, N. Y.

The various methods, techniques, and equipment used for the mounting, grinding, polishing, etching, and replication of metallographic samples in a remote metallography cell are described. (NSA, 1959, #17,629)

1,104. VERSATILE STRESSING DEVICE FOR  
SMALL SPECIMENS

Rapperport, E. J., Gelles, S. H.

April 21, 1959

Nuclear Metals, Inc., Concord, Mass.

NMI-1214, AT(30-1)-1565

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

A compact device is described that is capable of exerting finely controlled forces to stress samples in tension, compression, or bending. The device is designed so that a rectangular cross-sectioned sample may be viewed microscopically on three of its four exposed faces during the stress application. After suitable calibration, both the stress and strain in the sample may be measured in all three types of loading. (NSA, 1959, #11,179)

1,105. MEASUREMENTS THROUGH A HOT CELL  
WINDOW USING OPTICAL TOOLING

Abbatiello, A. A.

April 23, 1959

Oak Ridge National Laboratory, Tenn.

ORNL-2658, W-7405-eng-26

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

Optical tooling was evaluated for the measurement of physical dimensions of radioactive parts through hot cell windows. Instruments were set up outside a 4-ft-thick lead-glass window. Although the window was not specially selected, the readings were within 1.0% of the true dimension. Use of a calibration chart of the window variations reduced the error to  $\pm 0.1\%$ . The method is considered feasible and sufficiently fast for a wide range of hot cell measurements. The reflections of a point light source from the lead-glass laminae form a convenient indicator of the window's measurement qualities. (NSA, 1959, #11,100)

1,106. A REMOTELY CONTROLLED  
METALLOGRAPH. II

Leith, W. H.

December 1959

E. I. du Pont de Nemours and Company,  
Savannah River Laboratory, Aiken, S. C.

DP-450, AT(07-2)-1

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

A Bausch and Lomb metallograph that had been adapted so that it could be operated remotely was modi-

fied further to facilitate its operation. The instrument has performed satisfactorily in the examination of highly radioactive materials behind the heavy shielding of a high level cell. (NSA, 1960, #9580)

1,107. PRELIMINARY REPORT OF ADVANCED  
VIEWING STUDIES FOR REMOTE  
HANDLING OPERATIONS

Brown, J. E.

August 2, 1960

General Electric Co., Aircraft Nuclear  
Propulsion Dept., Cincinnati, Ohio

DC-60-8-32, AT(11-1)-171

The problems of proper viewing of remote handling operations are discussed. Presently known methods of remote viewing are surveyed. It is concluded that only small improvements in methods presently employed are possible. It is further concluded that a study of a versatile optical system should be performed to determine feasibility and cost. (NSA, 1962, #20,562)

1,108. LUNAR EXPERIMENTS — PHYSICAL  
AND BIOLOGICAL

In "Proceedings of Lunar and Planetary  
Exploration Colloquium, Vol. II, No. 3,"  
pp. 43-55, Proceedings of Colloquium held  
in Downey, Calif., November 1960

North American Aviation, Inc., Los Angeles,  
Calif., August 15, 1961

1,109. SETF REMOTE VIEWING TECHNIQUES

Burton, J. H.

In "Proceedings of the Eighth Conference on  
Hot Laboratories and Equipment, San Francisco,  
Calif., December 13-15, 1960," pp. 263-276  
American Nuclear Society, Chicago, Ill.

(Obtainable as TID-7599, Office of Technical  
Services, Washington, D.C.)

Windowless hot cells in the SNAP Experimental Test Facility necessitated the development of unique remote viewing equipment and techniques. The development was undertaken at Atomics International under contract to the Office of Aircraft Reactors of the Atomic Energy Commission as part of the SNAP 2 program. A description is given of the facility features and equipment that affect the remote viewing program, and the equipment and techniques developed. Mentioned are the Traverse

Television System, through-roof television camera, through-roof periscope, miniature television camera, and procedures for handling and setting up the remote viewing equipment. (NSA, 1961, #4831)

1,110. IMPROVEMENTS IN OR RELATING TO APPARATUS FOR REMOTE WEIGHING OF RADIOACTIVE MATERIALS

Guest, W. R.

September 13, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 877,064 (assigned to United Kingdom Atomic Energy Authority)

A balance is designed for weighing, igniting, and reweighing radioactive samples. The balance is mounted above a shielded cubicle and has a rod suspended from its beam and extending into the cubicle with a balance pan at its lower end. A vertical tube furnace in the cubicle is adapted to be raised to surround the balance pan, and a means is provided for withdrawing air from the furnace. (NSA, 1961, #30,805)

1,111. ELECTRONIC INSTALLATION AT SWEDISH SAWMILL

The Engineer, v. 212, no. 5513, pp. 496-497,  
September 22, 1961

Equipment measures debarked logs for sorting into various sizes before they are fed to saws. Output signals from photoelectric cells on either side of the conveyor are fed to a memory device attached to a subsequent conveyor which feeds to a metal detector and saws; 22-in.-D classes can be individually set in steps of  $\frac{1}{4}$  in. on a programming unit. The sorting result can be observed on a lamp display. (EI, 1961)

1,112. IMPROVEMENTS IN OR RELATING TO MEASURING APPARATUS

Ellen, F. P., Leet, G.

November 8, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 881,620 (assigned to United Kingdom Atomic Energy Authority)

An apparatus is designed for measuring dimensional changes of remote objects, e.g., within a reactor. The apparatus comprises a plunger-operated rotary micrometer gage, a rotary position transmitter, and fluid pressure-actuated means for advancing and retracting the plunger. (NSA, 1962, #2013)

1,113. CONTINUOUS DIPMETER SURVEY CAN BE AN IMPORTANT EXPLORATION TOOL

Thompson, J. D.

*Oil and Gas Journal*, v. 59, pp. 128-131,  
December 18, 1961

1,114. TELEVISION GOES UNDERGROUND

*Rock Products*, v. 64, pp. 96-97,  
December 1961

1,115. NEW GAGE SIMPLIFIES BOTTOM-HOLE PRESSURE SURVEYS

Bleakley, W. B.

*Oil and Gas Journal*, v. 60, pp. 83-84,  
January 22, 1962

1,116. GRAVITY AND AEROMAGNETIC EXPLORATION IN THE PARADOX BASIN

Steenland, N. C.

*Geophysics*, v. 27, pp. 73-89, February 1962

1,117. OPTICAL INSPECTION DEVICE USING FIBER OPTICS

February 1962

Sandia Corporation, Albuquerque, N. Mex.  
Final Report for April-August 1961,  
SCR-308, AT(29-1)-789

Activities in a program for development of a highly flexible inspection probe having an insertion length of 36 in. and an outer diameter of less than 0.380 in. are described. The purpose of the inspection device is to view a remote cavity containing one or more wires. The design of a probe is described which has four small compact light sources, opaque covers over individual coated fibers, and a fiber optics illumination plate at the distal end. The outside diameter is 0.380 in., thus permitting the use of more illumination and imaging fibers. The field of view illumination is 22 foot-candles, giving good image contrast and allowing objects 1.5 in. from the probe to be viewed at a resolution of 15 lines per inch. Therefore, the image of a  $\frac{1}{16}$ -in.-D wire is equivalent to two fiber diameters. It is felt that this probe fulfills the design specifications and demonstrates the feasibility of constructing a highly flexible fiber optics probe utilizing co-axial illumination. (NSA, 1962, #11,928)

1,118. DEVELOPMENT OF ULTRASONIC  
TECHNIQUES FOR THE REMOTE  
MEASUREMENT OF THE HRT CORE  
VESSEL WALL THICKNESS

McClung, R. W., Cook, K. V.

March 15, 1962

Oak Ridge National Laboratory, Tenn.  
ORNL-TM-103, W-7405-eng-26

Design and development of a remote ultrasonic inspection technique for use in measuring wall thicknesses in the HRT core vessel are described. (NSA, 1962, #10,265)

1,119. IMPROVEMENTS IN OR RELATING TO  
MEANS FOR VIEWING AN ELEMENT  
LOCATED WITHIN AN ENCLOSED SPACE

Wills, S. C. F.

May 9, 1962

U.S. Department of Commerce, Washington, D.C.  
British Patent 895,893 (assigned to  
Strachan and Henshaw, Ltd.)

An apparatus is designed for viewing a deeply indented element, e.g., a finned fuel element, within a pressurized

enclosed space, such as the pressurizable servicing path from a charge/discharge machine to a reactor pressure vessel. The apparatus includes a viewing beam path and an illuminating beam path arranged in parallel and directed through a single aperture; a pair of right-angle prisms is provided in the illuminating beam path to bring it closer to the viewing beam path. (NSA, 1962, #19,023)

1,120. SCIENTIFIC EXPERIMENTS FOR  
*MARINER R-1 AND R-2*

Wyckoff, R. C., Editor

July 15, 1962

Jet Propulsion Laboratory, California  
Institute of Technology, Pasadena  
TR 32-315

The scientific experiments which were to be carried aboard the *Mariner R* spacecraft are described. The scientific experiments included the investigation of the radiation emission from the planet Venus, and the magnetic fields and the charged particle and cosmic dust flux in interplanetary space and in the vicinity of Venus.

## GRIPPING AND HOLDING MECHANISMS AND EQUIPMENT

- 1,121. STEEL WORKS CRANE WITH  
MECHANICALLY OPERATED TONGS  
*The Engineer*, v. 198, p. 337, September 3, 1954

- 1,122. HANDLING; TONGS MOVE INGOTS  
*Iron Age*, v. 177, p. 92, January 19, 1956

- 1,123. TONG-HOIST ROLL HANDLING  
AT SEALRIGHT  
*Paper Trade Journal*, v. 140, p. 34,  
June 18, 1956

- 1,124. HANDLING; STEEL MILL  
WORK ROLL TONGS  
*Iron Age*, v. 178, p. 120, November 1956

- 1,125. TONGS AND POWER TONGS  
Murphy, C. E.  
*Petroleum Engineer*, v. 29:B, p. 124,  
January 1957

- 1,126. GRAB BUCKETS HANDLE HOT SLAG  
*Iron Age*, v. 179, p. 134, April 18, 1957

- 1,127. AIR FROM CRANE OPENS BUCKET  
*Construction Methods and Equipment*,  
v. 39, pp. 207-208, May 1957

- 1,128. USES END-WELDED STUDS AS  
TONG HOLDS IN FORGING  
*Iron Age*, v. 180, pp. 110-111, August 8, 1957

- 1,129. GRIPPER JAWS UNLOAD PANELS  
EFFICIENTLY, SAFELY  
Chase, H.  
*Iron Age*, v. 180, pp. 130-131,  
December 12, 1957

- 1,130. REMOTE RETRIEVING TOOL  
Fromm, L. W., Jr.  
August 19, 1958  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,848,266 (assigned to U.S. Atomic  
Energy Commission)

A retrieving tool is described to securely grasp an object for emplacement in, or withdrawal from, an elongated tube. The object is grasped by hooks actuated by a wedge and cam mechanism. The mechanism on the end of a long rodlike structure is controlled by levers or bars at the access end of the tube. This device is particularly useful for positioning fuel elements within a reactor core. (NSA, 1959, #1024)

- 1,131. IMPROVED MASTER-SLAVE  
MANIPULATOR HAND  
Leith, W. H.  
*Nucleonics*, v. 16, no. 12, pp. 70-71,  
December 1958

A new hand has been developed for the Argonne-type master-slave manipulators in use at the Savannah River Laboratory. An innovation in the hand is the flexibility provided by detachable fingers. An important advantage is the protection afforded moving parts of the hand against contamination by the gauntlet. The hand is now standard on all new SRL manipulators. (NSA, 1959, #2940)

- 1,132. TONGS FOR RADIOACTIVE MATERIALS  
*The Engineer*, v. 207, p. 432, March 13, 1959

- 1,133. SAMPLE HOLDER FOR DIFFERENTIAL  
THERMAL ANALYSIS OF FUSIBLE  
OR REACTIVE SAMPLES  
Fitch, J. L., Hurd, B. G.  
*American Mineralogist*, v. 44, pp. 431-433,  
March 1959

- 1,134. BIG "ICE TONGS" SAVE TIME IN  
STEEL SHEETPILE REMOVAL  
Tess, O. A.  
*Engineering News*, v. 162, pp. 80-81,  
May 14, 1959

- 1,135. TONGS MOVE COILED STRIP  
EASILY WITHOUT DAMAGE  
*Steel*, v. 145, p. 68, August 31, 1959

- 1,136. DESIGN CALCULATIONS FOR TWO TEST REMOTELY OPERABLE QUICK DISCONNECTS

Keim, J. J.

September 21, 1959

General Electric Company, Aircraft Nuclear Propulsion Dept., Cincinnati, Ohio  
DC-59-9-154, AT(11-1)-171

Design calculations for two flange-type quick disconnects are presented. Both clamps are essentially of the modified Marman type with design changes to accommodate remote handling requirements. These disconnects are for use in connection with propulsion systems components. (NSA, 1962, #20,561)

- 1,137. PLASTICS FOAM HANDLER:

FLEXIBLE GRAB

*Plastics World*, v. 17, p. 32, September 1959

- 1,138. HOLDER AIDS SCREW MODIFICATION

Haller, K.

*American Machinist*, v. 103, p. 123,  
October 5, 1959

- 1,139. A COOLED SAMPLE HOLDER FOR THE X-RAY SPECTROGRAPH

Dwiggins, C. W., Jr., Lindley, J. R., Eccleston, B. H.

*Analytical Chemistry*, v. 31, p. 1928,  
November 1959

- 1,140. MAGNETIC HOLDING FIXTURES

Suchenek, F. L.

*Tool Engineer*, v. 43, pp. 193-195,  
November 1959

- 1,141. IMPROVEMENTS IN OR RELATING TO REMOTE HANDLING MECHANISMS

Orr, D.

December 16, 1959

U.S. Department of Commerce, Washington, D.C.  
British Patent 825,553 (assigned to United Kingdom Atomic Energy Authority)

An adaptor for the grip device described in patent No. 825,552 is described which will make it possible to operate several different tools with one handle. (NSA, 1960, #6482)

- 1,142. ENGINE LINES ACCELERATED WITH AUTOMATIC TONGS

*Steel*, v. 146, p. 77, January 25, 1960

- 1,143. IMPROVED FORM OF SPRING-CLIP FOR HOLDING DOWN A WORK-PIECE

Harrison, P. W.

*Journal of Scientific Instruments*, v. 37, p. 38,  
January 1960

- 1,144. CABLE TENSION OPERATES WORK-CLAMPING LEVERS

Chase, H.

*Machinery*, v. 66, p. 124, February 1960

- 1,145. NOVEL WORK-HOLDER FOR LATHE OPERATIONS

Bossmann, C.

*Machinery*, v. 66, p. 138, May 1960

- 1,146. GRIPS FOR TENSILE TESTS ON VERY EXTENSIBLE TAPES

Day, A. G.

*Journal of Scientific Instruments*, v. 37,  
pp. 181-182, May 1960

- 1,147. NEW TONGS GIVE CONSTRUCTION A SAFE GRIP

*Safety Maintenance*, v. 120, p. 20, July 1960

- 1,148. ELECTROMAGNETIC RELEASE MECHANISM

Michelson, C.

September 13, 1960

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,952,802 (assigned to U.S. Atomic Energy Commission)

An electromagnetic release mechanism is offered that may be used, for example, for supporting a safety rod for a nuclear reactor. The release mechanism is designed to have a large excess holding force and a rapid, uniform, and dependable release. The fast release is accomplished by providing the electromagnet with slotted poles separated by an insulating potting resin, and by constructing the poles with a ferro-nickel alloy. The combination of these two features materially reduces the eddy current power density whenever the magnetic field changes during a release operation. In addition to these features, the

design of the armature is such as to provide ready entrance of fluid into any void that might tend to form during release of the armature. This also improves the release time for the mechanism. The large holding force for the mechanism is accomplished by providing a small, selected, uniform air gap between the inner pole piece and the armature. (NSA, 1961, #8319)

**1,149. HAND CLAMPS MAKE UP BUSINESS  
END OF CONVEYOR: NON-RUST  
TREATMENT FOR EXHAUST  
AND TAILPIPES**

*Mill and Factory*, v. 67, p. 124, September 1960

**1,150. LIFTING DEVICE FOR NUCLEAR  
ENGINEERING**  
October 12, 1960  
U.S. Department of Commerce, Washington, D.C.  
French Patent 1,233,492 (assigned to  
Plessey Co., Ltd.)

A totally mechanical lifting device comprising a grab organ is described. This grab organ has a number of gripping elements situated at different places in its periphery, each having a forward position for engaging with the body to be lifted and a retracted position for releasing it. Means are provided for constraining these elements in the retracted or in the forward position. Preferably, the body to be lifted has a male cone-shaped handling head which during the let-down movement of the grab enters a tube mounted in the center of said grab, the tube having a funnel-shaped lower extremity. The said gripping elements are suitably constituted by balls that rest in lateral openings of the tube and can be pushed in centripetal direction. These elements are held in the retracted position by a piston sliding in the tube, the piston being moved back against spring action by the handling head of the body as it enters the tube. On the said tube a further tube slides, the lower extremity of which has a female cone-shaped surface so that the axial thrust imposed on this outer tube is transformed into the centripetal thrust imposed on the balls when this surface abuts against them; in this way the balls are made to engage in an annular recess in the handling head. In the forward position of the balls, this latter tube slides over the openings in which the balls rest to lock the balls in the forward position. (NSA, 1962, #5454)

**1,151. ROD-HOLDING FIXTURE PERMITS  
CHECKING TAPERS IN MACHINE**  
Hall, N.

*American Machinist/Metalworking  
Manufacturing*, v. 104, p. 115, October 31, 1960

**1,152. VACUUM-TIGHT SAMPLE HOLDER FOR  
HIGH TEMPERATURE CONDUCTIVITY  
MEASUREMENTS**

Friauf, R. J.

*Review of Scientific Instruments*, v. 31,  
pp. 1161-1163, October 1960

**1,153. OSCILLATING FLAT-SPECIMEN  
HOLDER FOR AN X-RAY  
POWDER CAMERA**

Wilkinson, J. D., Calvert, L. D.

*Journal of Scientific Instruments*, v. 37,  
pp. 399-400, October 1960

**1,154. LATCHING DEVICES FOR NUCLEAR  
FUEL ELEMENTS**

Moulin, M. P. A.

January 17, 1961

U.S. Department of Commerce, Washington, D.C.  
Canadian Patent 612,848 (assigned to  
Commissariat à l'Energie Atomique)

A latching device for holding columns of fuel slugs in position in the channels of a reactor is described. The latch may be operated by automatic remote control with an accuracy sufficient to eliminate the possibility of jamming or other defective operation. The latch is simple and has high resistance to mechanical, thermal, and neutron stresses. The latching mechanism consists of a hollow body provided with latching fingers. The fingers are movable and are adapted to project from the body. The mechanism also includes a slidable member which is movable longitudinally with respect to the body between two end positions; this member acts in opposite direction from the fingers and engages the side of the body for locking the fingers. When the fingers move in the reverse direction from the locked position, the slidable member automatically releases the body. (NSA, 1961, #21,827)

**1,155. VELVET-GLOVE FIXTURING HOLDS  
FRAGILE PART FOR MULTIPLE-  
FORM CUTS**

Collins, L. W., Jr.

*Machinery*, v. 67, pp. 116-119, January 1961

- 1,156. WORK-HOLDING RIG SIMPLIFIES FLAME CUTTING  
Gordon, R. C.  
*American Machinist/Metal Working Manufacturing*, v. 105, p. 128, February 20, 1961

- 1,157. HYDRAULIC CLAMPING CUTS OVER-ALL MACHINING TIME  
Exely, W. M.  
*Tool and Manufacturing Engineer*, v. 46, no .2, pp. 79-82, February 1961

Feasibility of using hydraulic clamping for short-run production is discussed and a clamping system described. Examples are given of fixtures using hydraulic clamps in machining of aluminum castings. Time saving aspects and other advantages of the fixtures are indicated. (*EI*, 1961)

- 1,158. A REMOTE SAMPLING SYSTEM FOR HIGH-LEVEL GAMMA SOURCES  
Palmer, R. C., Davis, D. K., Willis, W. V.  
*International Journal of Applied Radiation and Isotopes*, v. 10, pp. 128-130, April 1961  
(in English)

A remote-control mechanism for introducing and removing samples from a 12-kc Cs<sup>137</sup> irradiator was designed and built with a "fail safe" electrical system. The lift mechanism is a solenoid which has a brass extension pinned and soldered to the core. Two ferromagnetic leaves are attached to the brass extension and are acted on by the magnetic field of the solenoid. A description of the solenoid is included, and the design and operation of the sample carrier are presented. (NSA, 1961, #19,504)

- 1,159. SIMPLICITY IMPROVES TOOLHOLDER VERSATILITY; CARB-O-LOCK  
*Steel*, v. 148, pp. 91-92, May 29, 1961

- 1,160. ENTWICKLUNGSLINIEN IN DER KONSTRUKTION VON KLEMMWERK-ZEUGEN (DEVELOPMENTS IN CONSTRUCTION OF CLAMPING TOOLS)  
Kerbusch, J.  
*Werkstattstechnik*, v. 51, no. 5, pp. 223-227, May 1961

Examples of various clamping possibilities are described and illustrated. (*EI*, 1961)

- 1,161. AUTOMATIC TONGS HANDLE HOIST JOB  
*Tool and Manufacturing Engineer*, v. 46, p. 82, June 1961
- 1,162. SELF-CENTERING POSITIVE LOCKING GRAPNEL  
Hopper, C. G.  
July 4, 1961  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,991,112 (assigned to Atomic Energy Commission)

A grapnel is described which is used for remotely securing a load to be hoisted. This patented grapnel is generally conical in shape with a plurality of semi-open bores laterally disposed about the device. The bores meet at the apex of the grapnel and there provide a securing pocket for a spherical member. A load provided with a rigid support rod having a spherical member at its end can be secured by directing the spherical member down one of the bores and into the securing pocket. The major advantages of the grapnel reside in the self-centering and positive locking features. (NSA, 1961, #22,414)

- 1,163. TrU FACILITY—ALPHA BOX ACCESSORIES—MANIPULATOR OPERABLE SPHERICAL JOINT CLAMP  
Klima, B. B.  
July 22, 1961  
Oak Ridge National Laboratory, Tenn.  
CF-61-3-129 (Revision 1), W-7405-eng-26

A special clamp has been designed and developed which is manipulator operable and which will clamp a standard spherical (glass) joint. This version of the clamp can be pre-adjusted to securely lock on the joint, owing to the incorporation of an adjustable seat for the over-center clamp. (NSA, 1961, #30,787)

- 1,164. HOT-CELL GRIPPING TOOL AND FUEL-ELEMENT-DISCONNECT TESTS  
Charles, J. R.  
August 3, 1961  
North American Aviation, Atomics International Division, Canoga Park, Calif.  
NAA-SR-Memo-6630, AT-11-1-GEN-8

Recommendations and results are given for determinations of the operating characteristics of the HNPF hot-cell gripping tool, the suitability of the fuel-element Mark II mechanical joint, and the effects of sodium exposure and steam cleaning on the mechanical joint and

on the process-tube to fuel-cluster latch, including the effect of the exposure on extraction of a fuel cluster from a process tube. (NSA, 1962, #4321)

- 1,165. ORANGE PEEL GRAB HANDLES SCRAP  
*Engineering*, v. 192, p. 149, August 4, 1961

- 1,166. ERFAHRUNGEN UEBER DIE  
GESTALTUNG UND DIE ARBEITSWEISE  
VON KLEMMWERKZEUGEN  
(EXPERIENCES WITH DESIGN AND  
OPERATION OF CLAMPING TOOLS)  
Heinlein, H.  
*Werkstattstechnik*, v. 51, no. 8, pp. 404-406,  
August 1961

Reference is made to difficulties in manufacture, utilization, and maintenance of brazed carbide tools. Various designs of clamping tools with hard metal cutting edges are described. It is emphasized that tools should conform to standards. (EI, 1961)

- 1,167. CARBOLOY CARB-O-LOCK TOOL-HOLDER  
OF EXCEPTIONAL DESIGN  
*Machinery*, v. 67, p. 142, August 1961

- 1,168. IMPROVEMENTS IN OR RELATING  
TO LIFTING MECHANISMS  
MacFarlane, C. J.  
September 20, 1961  
U.S. Department of Commerce, Washington, D.C.  
British Patent 877,620 (assigned to United  
Kingdom Atomic Energy Authority)

A grab is designed for removing extraneous objects from fuel element or control rod channels in heterogeneous reactor cores. The grab comprises an outer tube, an inner tube rotatably mounted within the outer tube, and chains connecting the ends of the tubes. In the open position, the chains hang in loops near the sides of the channel; by rotation of the inner tube, the chains are drawn to a taut position, thereby trapping any object situated within the grab. (NSA, 1961, #30,807)

- 1,169. MODIFICATION OF ALLIED  
ENGINEERING CORPORATION  
MANIPULATOR TONG  
Peishel, F. L., Hutto, E. L.  
October 6, 1961  
Oak Ridge National Laboratory, Tenn.  
ORNL-TM-37, W-7405-eng-26

A manipulator tong was modified to include an alpha seal at the slave end. This arrangement is used in conjunction with manipulators in a lead-shielded glove box to obtain protection from both gamma and alpha radiation. (NSA, 1962, #1883)

- 1,170. HOSE CLAMP HOLDS WORK IN LATHE  
Hansen, H.  
*American Machinist/Metalworking  
Manufacturing*, v. 105, p. 151, October 16, 1961

- 1,171. IMPROVEMENTS IN OR RELATING TO  
GRABS FOR REMOVING OBJECTS FROM  
DEEP AND NARROW CHANNELS  
Parr, E., Jobbins, J. K.  
October 18, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 880,294 (assigned to United  
Kingdom Atomic Energy Authority)

A grab is designed for removing extraneous objects from fuel element or control rod channels in reactor cores. In operating the grab, a series of flexible fingers are drawn together to form a grab mechanism by the action of drawing up a looped cable engaging the fingers at their free ends. (NSA, 1962, #311)

- 1,172. IMPROVEMENTS IN OR RELATING TO  
GRIPPING DEVICES  
October 18, 1961  
U.S. Department of Commerce, Washington, D.C.  
British Patent 880,162 (assigned to  
Commissariat a l'Energie Atomique)

A positioning and gripping device, which may be more reliably and rapidly handled than previous devices, is designed for particular use in machining graphite rods or bricks for reactor use. (NSA, 1962, #309)

- 1,173. SPECIAL HOLDER FEEDS  
COLLAPSIBLE TAPS  
Schafer, R.  
*American Machinist/Metalworking  
Manufacturing*, v. 105, p. 131, October 30, 1961

- 1,174. ECONOMIC PROCESSING OF  
WELDMENTS FOR IBM DATA  
PROCESSING MACHINE FRAMES; NEW  
HYDRAULIC SWING CLAMP  
Matthews, G. A.  
*Welding Journal*, v. 40, pp. 1042-1044,  
October 1961

- 1,175. WRAP-AROUND PIPE REPAIR CLAMP GIVES MORE ADJUSTMENT  
*Gas Age*, v. 128, p. 16, November 23, 1961

- 1,176. IMPROVED REFLECTION DIFFRACTION HOLDER FOR ELECTRON MICROSCOPE  
Henderson, J. C.  
*Journal of Scientific Instruments*, v. 38, p. 453, November 1961

- 1,177. CLAMSHELL BUCKET CARE; KEY TO SUCCESSFUL PERFORMANCE  
Polinek, C. J.  
*Pit and Quarry*, v. 54, pp. 144-146+, November 1961  
(See also *Foundry*, v. 90, pp. 151+, January 1962)

- 1,178. MAGNETIC CHUCKS FOR PLANNING  
Soukup, H. C.  
*American Machinist/Metalworking Manufacturing*, v. 105, p. 111, December 11, 1961

- 1,179. TILT-UP FIXTURES FOR NUMERICALLY CONTROLLED DRILLING  
Hoss, R.  
*American Machinist/Metalworking Manufacturing*, v. 105, p. 61, December 25, 1961

- 1,180. RECENT DEVELOPMENTS IN MAGNETIC WORK-HOLDING DEVICES FOR MACHINE TOOLS  
Jones, J. C.  
*Institution of Electrical Engineers, Proceedings of the, Part A—Power Engineering*, v. 108, pp. 566-567, December 1961

- 1,181. SIMPLE TOOLS FOR REMOTE RADIOACTIVE OPERATIONS  
Schadek, J., Ujhelyi, C.  
*Magyar Tudományos Akadémia Atommag Kutató Intézeté (Debrecen), Közlemények*, v. 4, pp. 235-236, 1961 (in Hungarian)

A few relatively simple but effective tools have been developed in the shops of the Institute of Nuclear Research of the Hungarian Academy of Sciences in Debrecen for the remote handling of experimental equipment. They include special clamps, found useful for handling and grasping cylindrical objects such as sources, glass am-

poules, breakers, etc. A special head facilitates operations involving wires or similar very thin objects. An automatically grasping, spring-loaded tool rendered good service for manipulating sealed sources; a thin steel or plastic wire was used to open the clamp against the pressure of the spring. (NSA, 1962, #19,019)

- 1,182. CLAMPING SHEET METAL  
*The Engineer*, v. 213, p. 104, January 12, 1962

- 1,183. GRAB HOPPER DREDGER MERSEY COMPASS  
*The Engineer*, v. 213, pp. 192-193, January 26, 1962

- 1,184. NEW BRITAIN-GRIDLEY FAST SETUP FEATURED ON 12-IN. CHUCKING MACHINE  
*Steel*, v. 150, p. 84, January 29, 1962

- 1,185. WHICH BUCKET FOR YOUR TRACTOR-SHOVEL JOB?  
*Roads and Streets*, v. 105, pp. 120-121, January 1962

- 1,186. NEW BRITAIN SIX-STATION CHUCKER SETS UP IN 60 SECONDS  
*American Machinist/Metalworking Manufacturing*, v. 106, p. 115, February 5, 1962

- 1,187. CLARKSON IMPROVED DEADLOCK CHUCK  
*The Engineer*, v. 213, p. 321, February 16, 1962

- 1,188. WORK LOADING MACHINE FOR AUTOMATICS  
*The Engineer*, v. 213, p. 322, February 16, 1962

- 1,189. DOUBLE TILTING SPECIMEN HOLDER FOR THE SIEMENS ELMISKOP I  
Patser, G. V., Swann, P. R.  
*Journal of Scientific Instruments*, v. 39, pp. 58-59, February 1962

- 1,190. SETUP TIME PRACTICALLY ELIMINATED ON NEW CHUCKING MACHINE  
*Machinery*, v. 68, pp. 120A-120D, February 1962

- 1,191. MICROBORE MACHINE DIVISION OF DeVlieg MACHINE COMPANY PRECISION BORING TOOL-HOLDERS WITH INDEPENDENT TWO-AXIS ADJUSTMENT  
*Machinery*, v. 68, p. 204, February 1962
- 1,192. POPE MODEL U-73 PRODUCTION CHUCKING GRINDER SETS UP FAST  
*Steel*, v. 150, p. 139, March 19, 1962
- 1,193. SAMPLE HOLDER FOR USE IN THE MEASUREMENT OF THERMOELECTRIC POWER OF THERMOELECTRIC MATERIALS  
Turco, J. F., Hickey, J., Bar-Gadda, I.  
*Review of Scientific Instruments*, v. 33, pp. 384-385, March 1962
- 1,194. MAGNET ACHIEVES FIELD STRENGTH OF 45,000 GAUSS  
*Electrical Engineering*, v. 81, p. 213, March 1962
- 1,195. NEW CHUCK AIDS SURFACE GRINDING; ELECTROPERM PERMANENT MAGNETIC CHUCKS  
LeGrand, R.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 74-75, April 2, 1962
- 1,196. THREE MACHINES REPLACED BY CHUCKER  
*Steel*, v. 150, pp. 70-71, April 9, 1962
- 1,197. SEVEN WAYS TO CHUCK THIN-WALL SHELLS  
Malm, D. C.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 106-107, April 30, 1962
- 1,198. SIMPLIFIED CHUCKING-INDEXING FIXTURE  
Haeussler, A. H. K.  
*Machinery*, v. 68, pp. 132-133, April 1962
- 1,199. PNEUMATIC CLAMPING AND FEEDING SYSTEM MECHANIZES CUTOFF SAW  
*Automation*, v. 9, p. 76, April 1962
- 1,200. EX-CELL-O TO FEATURE CONTOUR PROJECTOR AND MAGNA-SINE MAGNETIC CHUCK  
*Machinery*, v. 68, p. 169, May 1962
- 1,201. SHELDON INTERNAL, EXTERNAL TRACING LATHE AND AUTOMATIC PRECISION CHUCKING MACHINE  
*Machinery*, v. 68, pp. 179+, May 1962
- 1,202. LIFTING DEVICES  
Bradley, N., Jones, J.  
June 19, 1962  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 3,039,811 (assigned to  
United Kingdom Atomic Energy Authority)
- A piston-operated grab is designed for retrieving articles from vertical channels of a reactor cooled with a vapor, e.g., steam. The volume enclosed by the piston and its cylinder is connectable to evacuating means and communicates with ambient pressure via a bleed valve or orifice. The grab is provided with remotely disposed indicating means. (NSA, 1962, #23,301)
- 1,203. SPECIMEN HOLDERS FOR REMOTE METALLOGRAPHY  
Posey, W. N., Alewine, G. B.  
*Metal Progress*, v. 81, p. 112, June 1962
- 1,204. CHUCKS KEEP UP WITH TODAY'S PRODUCTION PACE  
Vlahos, C. J.  
*Mill and Factory*, v. 71, pp. 65-67, July 1962

## POSITIONING MECHANISMS AND EQUIPMENT

**1,205. POSITIONING SERVOMECHANISM WITH FINITE TIME DELAY AND SIGNAL LIMITER**

Evans, D. H.

*IRE Transactions on Automatic Control*,  
v. AC-2, pp. 6-90, February 1957

**1,206. MAGNETIC JACK—NEW CONTROL DRIVE MECHANISM**

Young, J. N.

*Nucleonics*, v. 15, no. 6, pp. 118-120, 122-123,  
June 1957

An arrangement was devised to meet a need for a control drive that would operate reliably in a water cooled reactor. A method of gripping magnetically, without use of a mechanical gripper mechanism, was devised. The functional description of a jack, its advantages and limitations, and other operating characteristics are given. (*EI*, 1957)

**1,207. CONTROL ROD DRIVE MECHANISM ON EBWR**

Bullinger, C. F., Kann, W. J.

*Nuclear Science and Engineering*, v. 3, no. 4,  
pp. 379-386, April 1958

Details are presented of mechanisms installed on an Argonne Experimental Boiling Water Reactor (EBWR) which are of externally operated lead screw and nut type. Other drive types, including electromagnetic jack, hydraulic, and rotary seal rack and pinion, are considered for EBWR application.

**1,208. QUICK RELEASEABLE DRIVE**

Dickson, J. J.

July 1, 1958

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,841,018 (assigned to  
U.S. Atomic Energy Commission)

A quick releasable mechanical drive system suitable for use in a nuclear reactor is described. A small reversible motor positions a control rod by means of a worm and gear speed reducer, a magnetic torque clutch, and a bell crank. As the control rod is raised to the operating position, a heavy coil spring is compressed. In the event

of an emergency indicated by either a "scram" signal or a power failure, the current to the magnetic clutch is cut off, thereby freeing the coil spring and the bell crank positioner from the motor and speed reduction gearing. The coil spring will immediately act upon the bell crank to cause the insertion of the control rod. This arrangement will allow the slow, accurate positioning of the control rod during reactor operation, while providing an independent force to rapidly insert the rod in the event of an emergency. (NSA, 1959, #976)

**1,209. NUT SCREW MECHANISMS**

Glass, J. A. F.

July 1, 1958

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,841,026 (assigned to  
U.S. Atomic Energy Commission)

A reactor control mechanism is described wherein the control is achieved by the partial or total withdrawal of the fissile material which is in the form of a fuel rod. The fuel rod is designed to be raised and lowered from the reactor core area by means of two concentric ball nut and screw assemblies that may telescope one within the other. These screw mechanisms are connected through a magnetic clutch to a speed reduction gear and an accurately controllable prime motive source. With the clutch energized, the fuel rod may be moved into the reactor core area, and fine adjustments may be made through the reduction gearing. However, in the event of a power failure or an emergency signal, the magnetic clutch will become de-energized, and the fuel rod will drop out of the core area by the force of gravity, thus shutting down the operation of the reactor. (NSA, 1959, #977)

**1,210. DEVICE FOR CONTROLLING INSERTION OF ROD**

Beaty, B. J.

October 14, 1958

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,855,899 (assigned to  
U.S. Atomic Energy Commission)

A device is described for rapidly inserting a safety rod into a nuclear reactor upon a given signal or in the event of a power failure in order to prevent the possibility of

extensive damage caused by a power excursion. A piston is slidably mounted within a vertical cylinder with provision for an electromagnetic latch at the top of the cylinder. This assembly, with a safety rod attached to the piston, is mounted over an access port to the core region of the reactor. The piston is normally latched at the top of the cylinder with the safety rod clear of the core area; however, when the latch is released, the piston and rod drop by their own weight to insert the rod. Vents along the side of the cylinder permit the escape of the air entrapped under the piston over the greater part of the distance; at the end of the fall the entrapped air is compressed, thereby bringing the safety rod gently to rest, and thus providing for a rapid automatic insertion of the rod with a minimum of structural shock. (NSA, 1959, #8357)

**1,211. IMPROVEMENTS IN OR RELATING TO  
CONTROL SYSTEMS FOR NUCLEAR  
REACTORS**

December 23, 1958

U.S. Department of Commerce, Washington, D.C.  
British Patent 806,409 (assigned to  
Reyrolle & Co., Ltd.)

(See also *Nuclear Power*, v. 4, p. 108,  
February 1959)

A combined control and shut-off rod by Reyrolle, a member of the Nuclear Power Plant Company, is suspended by a flexible chain or cable from a windless drum, mounted on the horizontal spindle of a reduction gearbox which is driven by a variable speed electric motor with no clutch between the rod and the motor. A second gearbox connects the other end of the motor shaft to an electromagnetic induction brake. For emergency shutdown, the motor is de-energized and the rod allowed to fall, under gravity but controlled by the brake. The inertia of the driving train constituted by the motor, gearing and moving parts is sufficiently low for it to fall rapidly enough while remaining coupled to the motor, driving the de-energized motor in reverse through the gearing. Final deceleration is produced by the brake whose torque is automatically raised with the rod's position by means of the variable-ratio gearbox. Absence of a clutch is claimed to lead to great reliability. (NSA, 1959, #8478)

**1,212. DIDO CONTROL SYSTEM: AN  
INVESTIGATION INTO THE USE OF D.C.  
INJECTION BRAKING OF THE COARSE  
CONTROL ARM DRIVING MOTOR**

Lavelle, P. M.  
December 1958

United Kingdom Atomic Energy Authority,  
Atomic Research Establishment,  
Harwell, Berks, England  
AERE-R/M-222

An investigation into the use of dc injection braking on the induction motors used for driving the coarse control arms in DIDO is reported. The application of dc injection braking is found to improve the response of the coarse control arms by appreciably reducing the amount of overrun encountered in positioning the arms. The dc injection braking involves the application of dc to two of the three-phase stator windings, the dc being applied immediately when the ac input is disconnected. Various values of dc braking current were used and the results are recorded. Phase-reversal braking has also been tried, and although faster acting, it is less attractive because it involves greater complexity. (NSA, 1959, #8231)

**1,213. DEVELOPMENT AND DESIGN OF THE  
CADMIUM CONTROL STATIONS FOR A  
BOILING HEAVY WATER REACTOR**

Christensen, H., Aarset, B.

A. S. John Greigs Boktrykkeri, Bergen, 1958

A description is given of the system for driving and controlling the cadmium rods for a 10-Mw boiling heavy water reactor, built in Halden, Norway. Different ways of positioning a control rod inside a pressurized system are discussed. Some special design features are described, and results of trial runs with a prototype control station are reviewed. (NSA, 1959, #4291)

**1,214. BRAKE DEVICE**

O'Donnell, T. J.

March 10, 1959

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,876,867 (assigned to  
U.S. Atomic Energy Commission)

A brake device is described for utilization in connection with a control rod. The device comprises a pair of parallelogram link mechanisms, a control rod moveable rectilinearly therebetween in opposite directions, and shoes resiliently supported by the mechanism for frictional engagement with the control rod. (NSA, 1959, #15,746)

**1,215. CONTROL FOR NEUTRONIC REACTOR**

Lichtenberger, H. V., Cameron, R. A.

March 31, 1959

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,880,155 (assigned to  
U.S. Atomic Energy Commission)

A control rod operating device in a nuclear reactor of the type in which the control rod is gradually withdrawn from the reactor to a position desired during stable operation is described. The apparatus is comprised essentially of a stop member movable in the direction of withdrawal of the control rod, a follower on the control rod engageable with the stop, and means urging the follower against the stop in the direction of withdrawal. A means responsive to disengagement of the follower from the stop is provided for actuating the control rod to return to the reactor shut-down position. (NSA, 1959, #15,750)

**1,216. INDICATION OF CONTROL-ROD POSITION**

Bryden, R. D., Simm, K. J.

*G.E.C. Atomic Energy Review*, v. 2, pp. 34-37,  
March 1959

. . . Descriptions are given of a control-rod winding mechanism and position transmitter installation. (NSA, 1959, #14,104)

**1,217. COAXIAL CONTROL ROD DRIVE MECHANISM FOR NEUTRONIC REACTORS**

Fox, R. J., Oakes, L. C.

April 14, 1959

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,881,619 (assigned to  
U.S. Atomic Energy Commission)

A drive mechanism is presented for the control rod of a nuclear reactor. In this device the control rod is coupled to a drive shaft which extends coaxially through the rotor of an electric motor for relative rotation with respect thereto. A gear reduction mechanism is coupled between the rotor and the drive shaft to convert the rotary motion of the motor into linear motion of the shaft with a comparatively great reduction in speed, thereby providing relatively slow linear movement of the shaft and control rod for control purposes. (NSA, 1959, #15,752)

**1,218. REACTOR CONTROL MECHANISM**

Lane, J. A., Engberg, R. E., Welch, J. M.

May 12, 1959

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,885,893 (assigned to  
U.S. Atomic Energy Commission)

A quick-releasing mechanism is described which may be used to rapidly drop a device supported from beneath

during normal use, such as a safety rod in a nuclear reactor. In accordance with this invention an electrical control signal, such as may be provided by radiation detection or other alarm condition sensing devices, is delivered to an electromagnetic solenoid, the armature of which is coupled to an actuating mechanism. The solenoid is energized when the mechanism is in its upper or cocked position. In such position, the mechanism engages a plurality of retaining balls, forcing them outward into engagement with a shoulder or recess in a corresponding section of a tubular extension on the upheld device. When the control signal to the solenoid suddenly ceases, the armature drops out, allowing the actuating mechanism to move slightly but rapidly under the force of a compressed spring. The weight of the device will urge the balls inward against a beveled portion of the actuating mechanism and away from the engaging section on the tubular extension, thus allowing the upheld device to fall freely under the influence of gravity. (NSA, 1959, #23,130)

**1,219. STUDIO DI UN SERVOMECCANISMO DI POSIZIONE A RIFLESSIONE DI FORZA REALIZZATO CON FRIZIONI MAGNETICHE A PARTICELLE (DESIGN OF A FORCE-REFLECTING POSITIONAL SERVOMECHANISM WITH MAGNETIC PARTICLE CLUTCHES)**

Mancini, C., Pulacci, A.

June 1959

Comitato Nazionale per le Ricerche Nucleari,  
Milan, Italy  
CNI-14

A description is given of a force-reflecting positional servomechanism with magnetic particle clutches. The characteristics of such a servomechanism are studied. The study is based on the theory of linear quadrupoles and gives satisfactory results with respect to the analysis of the system stability and to its dynamic response. A mechanical analog system giving an intuitive and synthetic representation is obtained. Data on a force-reflecting servomechanism are tabulated. The laboratory experiments are described in detail. (NSA, 1959, #22,267)

**1,220. POSITIONING DEVICE**

McCorkle, W. H.

July 14, 1959

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,894,647 (assigned to  
U.S. Atomic Energy Commission)

A positioner for a control rod for a nuclear reactor is described. The positioner includes a spur gear and rack for adjusting the control rod slowly and in small amounts, as well as a piston and cylinder for moving the control rod rapidly through larger distances. The positioner also has associated with it a worm wheel and gear for rotating it out of engagement with the control rod. (NSA, 1960, #3199)

**1,221. POSITIONING DEVICE**

Wall, R. R., Peterson, D. L.

September 15, 1959

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,904,168 (assigned to

U.S. Atomic Energy Commission)

A positioner is described for a vertical reactor-control rod. The positioner comprises four grooved friction rotatable members that engage the control rod on all sides and shift it longitudinally. The four friction members are drivingly interconnected for conjoint rotation and comprise two pairs of coaxial members. The members of each pair are urged toward one another by hydraulic or pneumatic pressure and thus grip the control rod so as to hold it in any position or adjust it. Release of the hydraulic or pneumatic pressure permits springs between the friction members of each pair to force them apart, whereby the control rod moves quickly by gravity into the reactor. (NSA, 1960, #7111)

**1,222. ELECTROMAGNETIC APPARATUS FOR POSITIONING A CONTROL ELEMENT**

Young, J. N.

September 30, 1959

U.S. Department of Commerce, Washington, D.C.

British Patent 821,164

A linear electromagnetic motor is described for positioning control elements in a reactor. Gripper coils which fasten to the rod are provided in addition to coils for moving the grippers. To move a control element, the mover coils move the gripper coils to gripping position, gripper coils are energized, and gripper coils (with rod) are moved by mover coils to desired rod position. (NSA, 1959, #22,358)

**1,223. DIGITAL REMOTE POSITION CONTROL**

Hilton, K. G.

*Electronic Engineering*, v. 31, pp. 512-519,

September 1959

**1,224. EVALUATION OF HNPF MARK B DRIVE**

Shaw, P. F.

October 13, 1959

North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.

NAA-SR-Memo-4514

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

Acceleration of the Hallam Power Reactor Mark B drive from zero to approximately 98% of maximum speed required from 0.126 to 0.267 sec. Deceleration of the control rod drive from full speed to zero varied from 0.061 to 0.073 sec using the magnetic brake. Full speed of the motor was determined for 54 rpm change gears and 22.6 rpm gears. A procedure for assembly of the motor is contained. (NSA, 1960, #18,635)

**1,225. ADVANCED DESIGNS OF MAGNETIC JACK-TYPE CONTROL ROD DRIVE**

Young, J. N.

November 1959

Argonne National Lab., Lemont, Ill.

ANL-6073, W-31-109-eng-38

(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

The magnetic jack is a device for positioning the control rods in a nuclear reactor, especially in a reactor containing water under pressure. Magnetic actuation precludes the need for shaft seals and eliminates the problems associated with mechanisms operating in water. It consists of a pressure shell, four sets of external stationary magnet coils (hold, grip, lift, pull down), and one internal moving part (armature) that imparts linear motion to a cluster of rods. (NSA, 1960, #10,172)

**1,226. NEUTRONIC REACTOR CONTROL ROD DRIVE APPARATUS**

Oakes, L. C., Walker, C. S.

December 15, 1959

U.S. Department of Commerce, Washington, D.C.

U.S. Patent 2,917,445 (assigned to

U.S. Atomic Energy Commission)

A suspension mechanism between a vertically movable nuclear reactor control rod and a rod extension, which also provides information for the operator or an automatic control signal, is described. A spring connects the rod extension to a drive shaft. The extension of the spring indicates whether (1) the rod is at rest on the reactor,

(2) the rod and extension are suspended, or (3) the extension alone is suspended, the spring controlling a three-position electrical switch. (NSA, 1960, #8270)

**1,227. REACTIVITY CONTROL DEVICE FOR NUCLEAR REACTORS**

January 26, 1960

U.S. Department of Commerce, Washington, D.C.  
French Patent 1,204,462 (assigned to British Thomson-Houston Co., Ltd.)

In order to get a substantially linear relationship between the reactivity and the position of the control rods, these rods (movable in a vertical direction) are grouped in such a manner that the channels of the respective groups lie at the corners of concentric polygons. Equipment is provided to move the rods of the same group simultaneously and independently of the rods of the other groups. The movement of the groups is performed successively, e.g., in such a manner that first the rods of the outermost groups are raised and then those of the succeeding groups; the rods are lowered in exactly the reverse order, viz., first those of the innermost groups and then successively those on the outside. The movement of a succeeding group begins before the movement of the preceding group is ended (NSA, 1961, #10,450)

**1,228. SCRAM DEVICE FOR THE RAPID SHUTDOWN OF REACTORS**

Gutmann, W.

February 18, 1960

U.S. Department of Commerce, Washington, D.C.  
German Patent DAS 1,075,757 (assigned to Metropolitan-Vickers Electrical Co., Ltd., and United Kingdom Atomic Energy Authority)  
(See also *Kerntechnik*, v. 2, p. 339, October 1960, [in German])

With the device described, a scram procedure could be carried out in which boron rod on drive elements and a magnetic braking device were let into or withdrawn progressively to the activity of the reactor in the core itself. A schematic representation of the device is given, and the operation is described. (NSA, 1961, #4729)

**1,229. CONTROL ROD DRIVE FOR NUCLEAR REACTORS**

March 1, 1960

U.S. Department of Commerce, Washington, D.C.

French Patent 1,209,297 (assigned to Société Alsacienne de Constructions Mécaniques)

A control rod drive is offered which comprises a horizontal shaft winch, to hoist or let down the cable from which the rod is suspended, in combination with an eddy-current brake mounted on the same axis, the winch being controlled by an electric motor. The groove provided for the cable on the winch drum approaches the axis toward the end of the run of the cable, in order to get a progressive action by reduction of torque produced by the control rod. This action is coupled with an increase of the brake action. (NSA, 1961, #10,458)

**1,230. NUCLEAR REACTOR**

March 18, 1960

U.S. Department of Commerce, Washington, D.C.  
French Patent 1,219,534 (assigned to General Electric Co., Ltd.)

Two neutron-absorbing elements are provided and coupled together in such a manner that the movement of one of these elements into the reactor is coupled with a movement of the other element out of the reactor. Neutron-absorbing bars connected by a nonabsorbing central section may be moved in different channels by the same motor. (NSA, 1961, #10,485)

**1,231. INDIKATOR NAKLONA NOVOI KONSTRUKTSII (NEW CONSTRUCTION OF DEFLECTION INDICATOR)**

Kalinin, A. G.

*Razvedka i Okhrana Nedr*, v. 26, no. 3, pp. 53-54, March 1960

New construction of a deflection indicator is described. This indicator is part of a drilling tool and uses the principle of a pendulum. (EI, 1961)

**1,232. IMPROVEMENTS IN OR RELATING TO MECHANISMS FOR CONTROLLING THE OPERATION OF NUCLEAR REACTORS**

Sutherland, D. M., Proctor, H., Jobbins, J. K., Kearney, J. L.

April 13, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 832,694 (assigned to Metropolitan-Vickers Electric Co., Ltd.)

A control rod drive mechanism is described which has an eddy current brake with movable magnets. A control

rod is raised and lowered by a tape and winding drum mechanism. (NSA, 1960, #14,551)

- 1,233. IMPROVEMENTS IN OR RELATING TO CONTROL ROD ASSEMBLIES FOR NUCLEAR REACTORS  
May 4, 1960  
U.S. Department of Commerce, Washington, D.C.  
British Patent 834,365 (assigned to Westinghouse Electric Corp.)

A coupling device is described for detachably engaging the control rods of a pressurized water reactor. The mechanism is simple and convenient, latches onto arms extending radially from the control rod, and releases quickly. (NSA, 1960, #15,437)

- 1,234. CAROLINAS-VIRGINIA NUCLEAR POWER ASSOCIATES, INC. QUARTERLY PROGRESS REPORT FOR THE PERIOD JANUARY 1, 1960 TO MARCH 31, 1960  
De Huff, P. G.  
May 1960  
Carolinas-Virginia Nuclear Power Associates, Inc., Charlotte, N.C.  
CVNA-52

...After a study of the various control rod drive systems, the decision was made to use a top-mounted gravity-scramming rack-and-pinion drive type for CVTR ... (NSA, 1961, #12,529)

- 1,235. AN ACCURATE CONTROL ROD POSITION INDICATOR SYSTEM  
Palmer, M. N., Morewitz, H. A.  
May 1960  
Westinghouse Electric Corp., Bettis Atomic Power Lab., Pittsburgh, Pa.  
WAPD-T-191, AT-11-1-GEN-14  
(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

This report, presented at the AIEE Pacific General Meeting in August 1960, describes a control-rod position-indicator system for experimental zero-power nuclear reactors. The system combines servomechanism practices and analog-to-digital conversion techniques and provides nonambiguous inline digital display with an accuracy of  $\pm 0.001$  in. over a 72-in. control-rod travel. A printed record of control-rod positions can be made of manually selected rods, or all rods can be automatically scanned in sequence and their positions recorded. (NSA, 1961, #3624)

- 1,236. IMPROVEMENTS RELATING TO ELECTRIC MOTOR CONTROL MEANS FOR NUCLEAR REACTORS  
Robertson, A. T., Hibbert, J. W.  
June 9, 1960  
U.S. Department of Commerce, Washington, D.C.  
British Patent 836,975 (assigned to A. Reyrolle and Co., Ltd.)

A control mechanism for moving control rods in and out of the reactor core by electric motors has been invented in which each motor has two or more separate windings supplied from a corresponding number of generators, each capable of producing full control of rod movement. Each motor's generator has a regulating means to enable all the motor windings to be supplied simultaneously and in synchronization. A diagram of a three-motor mechanism is given. (NSA, 1960, #25,023)

- 1,237. MECHANICAL POSITIONER SOLVES HEAT TREATING PROBLEM  
*Steel*, v. 146, pp. 156-157, June 13, 1960

- 1,238. OMR (PIQUA) UNITIZED CONTROL-SAFETY ROD PROTOTYPE TESTS  
Howell, J. D., Weeks, C. C.  
June 30, 1960  
North American Aviation, Inc., Atomics International Div., Canoga Park, Calif.  
NAA-SR-5077, AT-11-1-GEN-8  
(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

A unitized magnetic jack driven control-safety rod was developed for the 45.5-thermal Mw organic moderated reactor (Piqua). The rod assembly, including neutron absorber, magnetic jack drive, shock absorber and position indicator, is designed to be installed inside the reactor core tank and to operate immersed in the reactor coolant (Santowax-R) at 550 to 600°F. Results of component tests were reported in NAA-SR-3172. Two prototype rods, representative of the type to be used in the Piqua plant, were subjected to extensive performance and life tests in hot Santowax-R. Requirements on rod speed (10 in./min) scram time (800  $\mu$ sec max) and position indicator accuracy ( $\pm 1/4$  in.) were met in these tests. Total rod travel without failure or maintenance of 86,000 and 65,000 ft, respectively, (equivalent to 10,750 and 8,125 full excursions) by the two prototypes demonstrated the reliability of the magnetic jack drive in this application. (NSA, 1960, #18,628)

1,239. IMPROVEMENTS RELATING TO  
ELECTRICAL POSITIONAL CONTROL  
APPARATUS

Ludbrook, L. C., Gregory, J. P.

July 27, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 842,458 (assigned to  
British Thomson-Houston Co., Ltd.)

An electric positional control apparatus is designed for reactor control rods so that the required amount of control apparatus is reduced. The apparatus includes a plurality of positional-type motors, a low-frequency ac voltage generator, and a control circuit that connects the motors individually, or in groups, to the generator. The motors are of the winding type for raising or lowering a load. Circuit diagrams of the apparatus are given.

1,240. AUTOMATIC ELECTRONIC COORDINATE  
MEASURING EQUIPMENT FOR HEAVY  
BORING MACHINE

Abramzon, E. L., Grin, G. L., Peliks, A. Ya.,  
Podlazov, S. S.

*Measurement Techniques* (English edition of  
*Izmeritel'naya Tekhnika*), no. 7, pp. 579-583,  
July 1960

Equipment is described for measuring displacement coordinates, both vertical and horizontal, of a heavy boring machine, by means of two circular inductive transducers. A reversible electronic counter which operates with decatrons is also presented. (*EI*, 1961)

1,241. METODIKA ORIENTIROVANNOI POSADKI  
KLINEV (METHOD OF ORIENTING  
DEFLECTION WEDGES)

Sultanov, B., Shandalov, G. I.

*Razvedka i Okhrana Nedr*, v. 26, no. 8, pp. 51-52,  
August 1960

Equipment and sequence of operations involved in orientation are discussed. (*EI*, 1961)

1,242. PROCESS AND DEVICE FOR THE  
REMOTE CONTROL OF THE SPEED OF  
ROTATION OF AN ORGAN PLACED  
INSIDE A NUCLEAR REACTOR AND FOR  
KEEPING THIS SPEED AT A CONSTANT  
VALUE THAT CAN BE VARIED AT WILL

September 5, 1960

U.S. Department of Commerce, Washington, D.C.  
French Patent 1,243,459 (assigned to  
Commissariat à l'Energie Atomique)

For the remote control of the speed of rotation of an organ placed inside a nuclear reactor, e.g. for the movable absorber cylinder of a reactor oscillator, the said cylinder is driven by two turbines, the first one being fed by an axial gas stream from a constant supply, and its blades being mounted on said cylinder. The blades of the second turbine are mounted on the cylinder so as to act as a brake and are fed radially by a variable gas stream to keep the speed of rotation of the cylinder constant. The speed of the cylinder is determined by a pencil of light shuttered by a disc, also fixed on the said cylinder and provided with slits. The light pulses produced in this manner are guided out from the reactor and fed to a detecting instrument, and thus serve to control the gas stream feeding the second turbine. (NSA, 1962, #15,850)

1,243. IMPROVEMENTS IN OR RELATING TO  
CONTROL MEANS FOR EFFECTING  
CONTROLLED MOVEMENT OF A  
MEMBER IN AN ENCLOSED SPACE

Britt, J.

September 14, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 848,075 (assigned to  
Rolls-Royce, Ltd.)

A reactor control rod drive mechanism is designed which effects rod movement by means of a magnet wrapped around the rod cylinder and a supply of a pressure fluid, e.g., liquid sodium coolant. In operation, the magnet is moved in the desired direction, up or down, and the pressure fluid is applied automatically to move the control rod in the same direction. Two configurations of the mechanism and their details and operation are given. (NSA, 1961, #8288)

1,244. APPARATUS FOR POSITIONING  
NEUTRON-ABSORBING MATERIAL  
WITHIN A NUCLEAR REACTOR

September 28, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 849,716 (assigned to  
U.S. Atomic Energy Commission)

An apparatus for positioning a neutron-absorbing material, particularly a safety member for terminating a chain reaction, in a reactor is designed so that it does not depend on gravitational forces and can be operated in a relatively small space adjacent to the reactor. The apparatus comprises a frame, a rotatable shaft and drum mounted on the frame, a magnetic clutch engagement with the drum, and a flat spring which is wound at one end

on the drum and which has a plate of neutron-absorbing material attached to its other end. In operation, the magnetic clutch prevents the spring from unwinding and is de-energized only when it is desired to release the spring into the reactor. The arrangement of the apparatus for lowering and raising a control member smoothly is also described. (NSA, 1961, #5805)

**1,245. MAGNETIC POSITION INDICATORS FOR REACTOR CONTROL RODS**

Medal, E.

*Automatic Control*, v. 13, no. 3, pp. 29-31,  
September 1960

Magnetic reed switches were developed as position indicators for reactor control rods. The most effective system appeared to be a single switch placed in the bottom of a thimble telescoping into a hollow lead screw. This screw carried an array of permanent ring magnets stacked with opposing poles facing each other the entire length of the stroke. When a single switch passed the stacked magnets, a pulse was received and then transmitted to a stepping motor. The stepping motor turned a potentiometer that furnished the read-out to the control circuitry. Position indication intervals of  $\frac{3}{4}$  in. were reliably furnished. A device that could indicate pole-slip was designed to furnish complete position indication during normal operation without the need of a thimble sensor. (NSA, 1961, #7037)

**1,246. MAGNETIC AUTOMATIC POWER-RANGE CONTROL FOR AN AIRCRAFT NUCLEAR REACTOR**

Russell, J. A., Hemmenway, S. F., Scharf, J. L., Sharr, P. C.

*AIEE, Transactions of the, Part I—Communication and Electronics*, no. 50, pp. 379-384,  
September 1960

Control system philosophy for an aircraft nuclear power plant is discussed. Advantages are asserted for a power-range magnetic control system with a minimum number of moving parts. Control system elements and computing devices are described. Performance of a breadboard version of the control system is evaluated. (NSA, 1961, #1070)

**1,247. MOTOR DRIVEN SCREW AND NUT MECHANISM FOR MOVING A PUSH ROD**

October 19, 1960

U.S. Department of Commerce, Washington, D.C.

British Patent 851,925 (assigned to  
U.S. Atomic Energy Commission)

A drive mechanism for moving reactor control rods is invented which may be used in a relatively small space, thus enabling control rods to be located in adjacent reactor channels, and which provides a great speed reduction in the conversion of rotary motion into linear motion. The mechanism comprises a drive screw rigidly coupled to a push rod and a motor for causing the screw to move the push rod. One embodiment of the invention and its dimensions and performance are described. (NSA, 1961, #5806)

**1,248. IMPROVEMENTS RELATING TO POSITION INDICATING APPARATUS FOR LINEARLY MOVABLE OBJECTS**

Moore, D., Poulter, H. J.

November 23, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 854,819 (assigned to  
English Electric Co., Ltd.)

An apparatus for indicating the position of a reactor control rod attached to a cable wound spirally on a drum is designed comprising a Magslip-type electric receiver and transmitter with a pinion on its shaft engaging a rack on a carriage, the carriage in turn engaging the thread of a screw which is driven through bevel gears by the winding drum. The pitch of the screw is varied progressively so that the carriage movement is directly proportional to the control rod movement and a linear scale can be used on the Magslip receiver. (NSA, 1961, #7072)

**1,249. IMPROVEMENTS IN OR RELATING TO MEANS FOR SHUTTING DOWN NUCLEAR REACTORS**

Long, E., Greenhalgh, F. G., Hack, L.

December 29, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 857,432 (assigned to  
United Kingdom Atomic Energy Authority)

A secondary shut-down system that will operate in the event of pressure-vessel rupture is designed comprising a magazine of boron-steel balls positioned above a tube in the reactor core and held in position by the magnetic field of energized coils. Upon coil de-energization, the balls fall into the tube to operate as a shut-down rod. When it is desired to restore the system to its inoperative state, the tube containing the balls is moved up with a grab and

the balls placed in the magazine. Drawings are included. (NSA, 1961, #8303)

1,250. ELECTROMAGNETIC DISPLACING MEANS FOR NEUTRON ABSORBING CONTROL RODS

December 29, 1960

U.S. Department of Commerce, Washington, D.C.  
British Patent 857,059 (assigned to  
Allmäntna Svenska Elektriska Aktiebolaget)

An electromagnetic device for displacing reactor control rods is designed comprising a tubular stator built up from a plurality of soft iron rings slid on a nonmagnetic tube containing a cylindrical armature which supports a control rod. The iron rings have slots for coils through which current is passed in such a manner that a multipolar dc field is produced, and the armature is constructed of magnet poles and yokes; the interaction between the multipolar dc and magnetic fields positions the armature and its control rod in the desired place. Harmonic interference is eliminated by making the pole pitches of the stator and armature slightly different from each other. One drawing is included. (NSA, 1961, #8299)

1,251. HOW TO BORE "CURVED" HOLE

Wade, O. R.

American Machinist/Metalworking  
Manufacturing, v. 105, no. 1, pp. 66-68,  
January 9, 1961

A method of boring an angled hole in a "single pass through" is described. A novel tooling concept used for boring angled holes in waveguides has proved so accurate that 50 out of 52 pieces in the first lot passed rigid inspection. (EI, 1961)

1,252. IMPROVEMENTS IN AND RELATING TO NUCLEAR REACTORS

Moore, D., Heath, H. H.

January 25, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 859,811 (assigned to  
English Electric Co., Ltd.)

A mechanism for varying the position of a control element in a reactor core is designed consisting of a drum, a cable for suspending the control element from the drum, and a driving motor. The drum is designed to wind the cable in layers so that the radius of the torque exerted by the drum on the cable decreases as the cable is

unwound. The motor is of the ac synchronous type and has a free-wheel device so that winding and unwinding of the cable is accomplished by the motor and the weight of the cable, respectively, with the motor acting as a brake in the latter case. The speed and torque of the motor are changed by varying the frequency of its supply source. One of the three guide sheaves is so arranged that, near the end of the unwinding of the cable, it absorbs the kinetic energy of the cable. Thus, when the control element needs to be inserted rapidly into the core, as in shutdown, its descent is controlled by the inertia of the winding mechanism, the braking torque of the motor, the decreasing radius of the torque of the cable on the drum, and the absorption of kinetic energy by the guide sheave near the end of the descent. (NSA, 1961, #10,441)

1,253. NEW ELECTRONIC INSTRUMENT TO SURVEY BOREHOLES

Holz, P.

Canadian Mining Journal, v. 82, no. 1,  
pp. 45-46, January 1961

This transistorized electronic instrument rapidly calculates changes of angle and direction. Information is immediately transmitted by cable to the surface where it is read off calibrated dials. The instrument consists of a stable RF oscillator and an amplifier connected through a lowering cable to a console on the surface. (EI, 1961)

1,254. POSITIONIEREN VON WERKZEUGMASCHINEN DURCH OPTISCHE MESSGERÄEDE (POSITIONING CONTROL OF MACHINE TOOLS BY MEANS OF OPTICAL MEASURING DEVICES)

Werkstatt und Betrieb, v. 94, no. 1, pp. 35-39,  
January 1961

Instruments and their advantageous application for positioning of heavy machine tools are described. Advantages of zero point position are given. (EI, 1961)

1,255. SHAFT POSITION INDICATOR FOR USE WITH JOURNAL BEARINGS

Hunter, J. J., Hughes, C. J.

British Journal of Applied Physics, v. 12, no. 2,  
pp. 73-80, February 1961

Equipment using transistors and designed for indication and measurement of position of a shaft within the bush of a journal bearing system is described. Although

designed for use on a bearing about 1-in. in diameter, equipment is easily adjustable for other bearing sizes and can give useful information with shaft speeds up to 20,000 rpm. Circuit details are discussed and accuracies of various units are assessed. (EI, 1961)

**1,256. POTENTIALITIES OF ACCURATE MEASUREMENT AND AUTOMATIC CONTROL IN PRODUCTION ENGINEERING**

Loxham, J.

*Mass Production*, v. 37, no. 2, pp. 89-100, 108, February 1961

Measurement and automatic control techniques available to produce products and parts to the standards of accuracy required are described. The article includes an example of a grinding gage, an automatic controller, and an automatic recorder used in experiments on automatic control of size. A record is presented from automatic recording equipment showing size distribution on 100 parts produced consecutively. Manual and automatic positioning devices and use of a moire fringe technique are explained.

**1,257. MATERIALS ENGINEERING RAISES MACHINE TOOL PERFORMANCE**

Eshelman, R. H.

*Iron Age*, v. 187, no. 10, pp. 96-98, March 9, 1961

In redesigning a control system for jig borers, DeVlieg Machine Tool Co., Detroit, has achieved depth control with a unique combination of dial and memory sleeve elements. Sleeves and control dogs are made as aluminum extrusions. Machining operation of a borer is improved. (EI, 1961)

**1,258. ARRANGEMENT FOR INTRODUCING ARTICLES INTO A CLOSED CHAMBER AND FOR REMOVING SAME**

April 12, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 865,215 (assigned to  
Electricite de France-Service National)

An apparatus for introducing rods into and removing them from a nuclear reactor when a pressure differential exists is described. The elevating device for handling articles to be moved into or out of the chamber consists of a cable, one end of which carries a grab adapted to engage the articles, the other end of which is controlled by a winch. (NSA, 1961, #19,508)

**1,259. HIGH-RELIABILITY MISSILE COMPONENTS MADE IN SHORT RUNS BY NOVEL TOOLING**

Collins, L. W., Jr.

*Machinery*, v. 67, no. 8, pp. 126-131, April 1961

A device applied by Arma to positioning attachment used on jig borers locates shaft bores in ultraprecise gear box frames for missile ground operational equipment, thereby eliminating the need of repositioning the machine table for each hole. . . . (EI, 1961)

**1,260. PINS MEASURE N/C POSITION**

Rhoades, J. M.

*American Machinist/Metalworking Manufacturing*, v. 105, no. 19, pp. 106-107, September 18, 1961

A position measuring system called "Accupin", which actually becomes a part of the machine tool itself, rather than of a control setup, was developed by General Electric. It can position linearly or circumferentially to 0.0003-in. accuracies. This new system, resembling comb (in its linear form) and operating on the magnetic induction bridge principle, offers a low-cost solution to the tough numerical control problem. (EI, 1961)

**1,261. POSSIBLE APPLICATIONS OF S.I.R.A. POSITION-SENSITIVE PHOTOCELL TO MACHINE TOOL CONTROL**

Baker, L. R.

*International Journal of Machine Tool Design and Research*, v. 1, no. 1-2, pp. 34-40, September 1961

Characteristics of a position sensitive photocell are stated. Applications of the photocell are grouped into two sections, depending on whether the servo loop is open or closed, with a choice made mostly on economic grounds. The cell employed in machine tool control produces very precise rectilinear movements of the tool. An apparatus designed for automatically recording straightness of machined ways is described. (EI, 1961)

**1,262. DESIGN OF HIGH PERFORMANCE POSITION CONTROL SYSTEM FOR MACHINE TOOL PROFILING OPERATIONS**

Royle, J. K., Cowley, A.

*International Journal of Machine Tool Design and Research*, v. 1, no. 1-2, pp. 98-109, September 1961

The demands on servomechanisms required for control are described. Also included in the discussion are: short stroke electro-hydraulic drives; circumvention of short stroke limitations; individual transfer functions and their limitations; modifications and shaping terms in loop; limitations of measuring systems; and design aspects. (EI, 1961)

- 1,263. RICHARDS TYPE SB 35 HORIZONTAL BORING MACHINE WITH TAPE CONTROL  
*Machinery*, London, v. 99, no. 2559, pp. 1265-1268, November 29, 1961

The tape control system of a machine supplied to Goss Printing Press Co., Preston, is applied to vertical movements of the spindle head and transverse movements of the work table. Coordinate positioning arrangements and measuring and control systems are described. (EI, 1961)

- 1,264. LOW PRESSURE PNEUMATICS FOR HIGH PERFORMANCE CONTROL; PNEUMATIC POSITIONAL SERVO FOR VEHICLE POWER STEERING  
Harned, J. L., Robertson, J., Jr.  
*Control Engineering*, v. 8, pp. 75-79, December 1961

- 1,265. NEW RANGE OF DIXI JIG-BORING MACHINES WITH NUMERICAL CONTROL  
*Machinery*, London, v. 99, no. 2560, pp. 1329-1334, December 6, 1961

A Type-3 SAE Swiss-produced machine has a provision for positioning a table longitudinally and transversely, and a spindle head vertically, by manual adjustment, in conjunction with optical equipment, by means of a bank of push buttons, whereby required positions are set numerically, or by punched tape. The machine follows a well-known Dixi design, with certain modifications, notably in connection with spindle head and drive, to provide increased rigidity and to ensure improved performance and accuracy. (EI, 1961)

- 1,266. TABLE SAWING GOES AUTOMATIC; POSITIONER IS INSTALLED ON A SPECIAL OLIVER 88 DW TABLE SAW  
*Iron Age*, v. 189, p. 107, January 25, 1962

- 1,267. MAGNETIC COIL TELLS WHEN CONTROL ROD SEATS  
Williams, W. E., Shon, F. J.  
*Nucleonics*, v. 20, p. 92, March 1962
- 1,268. PROJECTION SYSTEM USED TO MEASURE AND POSITION ARC  
*Welding Engineer*, v. 47, p. 90, April 1962
- 1,269. ELECTRONIC RIP FENCE POSITIONING CONTROL FACILITATES ACCURATE CUTTING OF NONFERROUS METALS; OLIVER DW 88 TABLE SAW  
*Machinery*, v. 68, pp. 222-223, May 1962
- 1,270. PROCESS AND DEVICE FOR REMOTE INDICATION OF THE CO-ORDINATES OF SUSPECTED ELEMENTS IN A NETWORK  
Cochinal, R., Megy, J.  
June 6, 1962  
U.S. Department of Commerce, Washington, D.C.  
British Patent 898,013 (assigned to Commissariat à l'Energie Atomique)  
A device for remote position indication of suspected elements in a network being searched for irregularities is designed which is especially applicable to scanning detection of faulty fuel elements in gas-cooled reactors. In this device, a belt bearing the reference numbers of the elements in the network is set in motion when an irregularity is detected and stopped automatically to indicate the reference number of the faulty element in front of the operator. An embodiment of the device is described for a network of 96 ducts arranged in 24 bundles of four ducts each. (NSA, 1962, #20,577)
- 1,271. FUEL ELEMENT HANDLING APPARATUS  
Newton, A. E., Richardson, G. K.  
June 10, 1962  
U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 3,039,949 (assigned to United Shoe Machinery Corp.)  
A fuel element extraction tool is designed for use with a fuel handling apparatus above a reactor. The tool has a load supporting means with strain measuring devices for sensing the direction and magnitude of the load imposed on the tool. (NSA, 1962, #23,305)
- 1,272. VERTICAL POSITIONING CUTS COSTS  
Eshelman, R. H.  
*Iron Age*, v. 189, p. 95, June 14, 1962

## HOISTING AND LOWERING MECHANISMS AND EQUIPMENT

- 1,273. SINKING-STAGE HOIST ENDS  
ROPE TROUBLE

*Engineering and Mining Journal*, v. 157,  
p. 114, November 1956

- 1,274. MOTOR BUCKET ELEVATOR  
SIMPLIFIES HANDLING

*Chemical Engineering Progress*, v. 54, p. 106,  
July 1958

- 1,275. PRIMENENIE PROMYSHLENNOSO  
TELEVIDENIYA NA SHAKHTNOM POLE  
(APPLICATION OF INDUSTRIAL TELE-  
VISION IN MINE HOIST)

Beliovskii, E. S.  
*Gornyi Zhurnal*, v. 135, no. 8, pp. 49-50,  
August 1959

Television allows the operator to follow the process of loading and unloading of the cage and reduces the time of the hoisting cycle. Experience in the Krivoi Rog mine indicates that time saved by use of television resulted in an additional 50,000 tons of ore hoisted in one year. (*EI*, 1961)

- 1,276. ROCK HOISTING AND HANDLING IN  
DETACHABLE CONTAINERS AS DE-  
VELOPED AT RIO TINTO MINES, SPAIN

Rich, E.  
*Institution of Mining and Metallurgy,*  
*Transactions of the*, v. 68, pt. 11 (1958-1959),  
pp. 493-518, August 1959

A description of the hoisting system and shaft equipment includes containers and their frames; loading station layout; automatic attachment and release from hoisting bails; dumping station layout with its ore pockets, movable chutes, dumping gear, and automatic chain attachment and release system; and loading and transport of containers. (*EI*, 1960)

- 1,277. UEBERBLICK UEBER DEN GEGEN-  
WAERTIGEN STAND DER SCHACHT-  
FOERDERUNG UNTER BESONDERER  
BERUECKSICHTIGUNG DES  
ERZBERGBAUS (REVIEW OF PRESENT  
STATUS OF MINE HOISTING WITH  
EMPHASIS ON ORE MINES)

Baer, S.

*Zeitschrift für Erzbergbau und Metall-  
hüttenwesen*, v. 12, no. 10, pp. 487-496,  
October 1959

Frame hoisting and skip hoisting, single- and double-tracked hoisting, charging operation, installation of guides, types and numbers of hoisting ropes, drums and hoist structures are covered. (*EI*, 1960)

- 1,278. BLECHTRANSPORT MIT VAKUUMBEBER  
UND LASTMAGNET (TRANSPORTATION  
OF SHEET WITH VACUUM HOIST AND  
HOISTING MAGNET)

Franzen, F.  
*Stahl und Eisen*, v. 79, no. 24, pp. 1803-1807,  
November 26, 1959

An illustrated description of automatic equipment of a sheet rolling mill, especially for handling large, single sheets of steel is presented. The use of compressed air, instead of vacuum, in control of grip tongs for handling billets is suggested. (*EI*, 1960)

- 1,279. PRZEBIEGI NIEUSTALONE INSTALACJI  
WYCIAGOWEJ Z SILNIKIEM  
ASYNCHRONICZNYM PRZY NIE  
WYROWNANYCH MOMENTACH  
STATYCZNYCH (NONSTATIONARY  
VELOCITY TREND OF MINE HOIST  
DRIVEN BY AC MOTOR UNDER CON-  
DITIONS OF UNEQUALIZED STATIC  
MOMENTS)

Szklarski, L.  
*Archiwum Gornictwa*, v. 4, no. 4, pp. 311-321,  
1959

- 1,280. CONTAINER RAISING AND TIPPING  
MACHINE

*The Engineer*, v. 209, p. 145, January 22, 1960

- 1,281. DISTANTSIONNOE UPRAVLENIE  
Kletevymi Podemami (REMOTE  
CONTROL OF CAGE HOISTS)

Lavronenko, E. E.  
*Ugol*, v. 35, no. 1, pp. 20-23, January 1960

- Control of safety brake and operating brake, telemetering of manometer, and depth indicator are discussed. (*EI*, 1961)
- 1,282. CABLELESS LIFT FOR TV MAST  
*The Engineer*, v. 209, p. 543, March 25, 1960
- 1,283. MOTION AND LOADING OF A HINGED RAMP WHICH SUPPORTS A SLIDING MASS  
Saelman, B.  
*ASME, Transactions of the, Series E — Journal of Applied Mechanics*, v. 27, pp. 177–181, March 1960
- 1,284. CONTRACTOR'S INVENTIONS TAKE WORK OUT OF FORMWORK  
*Construction Methods and Equipment*, v. 42, no. 3, pp. 98–101, March 1960
- The use of special devices in construction of a three-story warehouse with total 750,000-ft<sup>2</sup> floor area is described. Corner irons, lifting brackets, elevating scaffolds, moving dollies, and lifting jacks were used to lift and position column forms. Workmen used two-way radios in coordinating and timing of operations. (*EI*, 1960)
- 1,285. OPREDELENIE NAIBOLSHIKH NATYAZHENII V PODEMNOM SHAKHTNOM KANATE PRI NORMALNOM REZHIME PODEMA (DETERMINATION OF MAXIMUM TENSIONS IN MINE ROPE DURING NORMAL CONDITIONS OF HOISTING)  
Neronov, N. P.  
*Akademiya Nauk SSSR, Izvestiya, Otdelenie Tekhnicheskikh Nauk, Mekhanika i Mashinostroenie*, no. 3, pp. 17–23, May–June 1960
- Effective loading, taking into account inertia, is determined by means of the Saint-Venant equation. Deduced formulas make it possible to plot a tension graph giving stresses in the critical cross section of wire rope as a function of time. (*EI*, 1961)
- 1,286. SUN OIL'S TRIPLE-PLAY PALLET LOADER; VACUUM-LIFT TRANSFER DEVICE  
*Modern Materials Handling*, v. 15, p. 84, August 1960
- 1,287. DEFORMATSIYA FASONNOI PROVOLOKI PRI PROIZVODSTVE ZAKRYTYKH PODEMNYKH KANATOV (DEFORMATION OF SHAPED WIRES IN MANUFACTURE OF CLOSED-TYPE ROPE FOR HOISTS)  
Khokhryakov, B. D.  
*Stal*, v. 20, no. 9, pp. 862–864, September 1960 (English translation available in *Steel (USSR)*, no. 9, pp. 699–701, September 1960)
- Deformation is effected by special deforming rings and sockets with shaped grooves producing axial torsion. Devices described make possible the production of closed twist-free ropes for pit hoists. (*EI*, 1961)
- 1,288. MOTORIZED LIFTING DEVICE SIMPLIFIES SHEET STACKING  
*Steel*, v. 147, p. 75, October 3, 1960
- 1,289. DER BETRIEB VON KOEPE-MEHRSEIL-FOERDERUNGEN IN DER SICHT TECHNISCHER WEITERENTWICKLUNG (PERFORMANCE OF MULTIROPE KOEPE HOIST FROM POINT OF VIEW OF TECHNICAL DEVELOPMENT)  
Hartland, K.  
*Bergbauwissenschaften*, v. 7, no. 19, pp. 507–516, October 20, 1960
- The present stage of development of multirope friction hoists is described as well as various points which have to be taken into consideration when designing these installations, in order to obtain optimum operating conditions. (*EI*, 1961)
- 1,290. DIFFERENTIAL BRAKING FOR MINE WINDERS  
Bartley, G. W.  
*Mining Magazine*, v. 103, no. 5, pp. 276–279, November 1960
- A method for selecting necessary braking at any position in shaft for balanced and unbalanced systems has been developed. Either fully compensated or partially compensated systems can be installed. Both types retain pre-selected back pressure in the brake cylinder in order to reduce the amount of braking normally applied by springs or deadweight. (*EI*, 1961)

- 1,291. SKIP HOIST SPEEDS ORE OUT OF KENNECOTT'S LIBERTY PIT IN ONE MINUTE  
*Mining World*, v. 22, no. 13, pp. 29-31, December 1960

Inclined hoist capacity is 1120 tph; slope is  $19^{\circ} 04'$ ; trackway is 1234 ft long with vertical winze of 405 ft. Two 25-ton skips consist of a doublewall welded body on a four-wheel open-frame chassis. The drum diameter of the hoist is 11 ft and is a double cylindrical clutched type. Semi-automatic control is one of the main features of the system. (*EI*, 1961)

- 1,292. IMPROVEMENTS OF SKIP HOIST DESIGN  
Kuznetson, I. E., Gants, S. M.  
*Coke and Chemistry USSR*, no. 12, pp. 28-30, 1960

Features are described of a new automatic skip hoist for coke ovens which discharges through the bottom opening and has only one pair of guide rails. (*EI*, 1961)

- 1,293. HIGH FLUX MAGNETS ASSIST BOREHOLE DRILLING  
*Mining Journal*, v. 256, no. 6543, p. 43, January 13, 1961

Magnetic elements made of Ticonal G are being widely applied to recover small loose ferrous pieces from the bottom of boreholes. By using Mullard Ticonal G magnetic material as the element, a 7-in.-D tool is capable of lifting weight of 150 lb, while the largest 14-in.-D tool lifts over two tons with full-face pull. (*EI*, 1961)

- 1,294. MULTIROPE FRICTION WINDERS  
Brawn, W. M.  
*Colliery Guardian*, v. 202, no. 5205, pp. 77-84, January 19, 1961

Mounting of a multirope winder is described, as well as selection of ropes for friction winders and rope capels. The method of control is presented. Development of mechanical brakes and safety interlocking is discussed. (*EI*, 1961)

- 1,295. INSTALLATION OF FRICTION WINDER  
Meyer, C., Read, C. B.  
*Iron and Coal Trades Review*, v. 182, no. 4827, pp. 139-142, January 20, 1961

A high-capacity four-rope friction winder powered by two dc motors of 2050 hp each is used in a new shaft at a South African gold mine. Mechanical equipment, rope-creep compensation, erection, and commissioning are discussed. (*EI*, 1961)

- 1,296. BEHAVIOR OF ROPES IN MULTI-ROPE FRICTION WINDERS  
Clarke, E. B., Smith, J. D.  
*Colliery Engineering*, v. 38, no. 444, pp. 61-63, February 1961

Results obtained from theoretical investigation into behavior of ropes in multirope friction winders are summarized. Causes of unequal rope loads, such as variations in physical properties of ropes, variations in winding sheave grooves, rope lack of fit, rope slip, and rope creep, are discussed. A multirope winding system is analyzed. (*EI*, 1961)

- 1,297. BELGIUM'S FIRST MULTI-ROPE WINDER  
Francotte, X., Landau, F.  
*Colliery Guardian*, v. 202, no. 5213, pp. 335-338, 340, March 16, 1961  
(See also *ASEA Journal*, v. 33, no. 7-8, pp. 107-113, 1960)

The hoist is intended for double hoisting of mine cars in four-deck cages and for transport of men and equipment. The pulley has two separate, combined service and emergency brakes which are completely independent of each other. The speed of the hoist is regulated by means of a metadyne amplifier in accordance with a closed-loop system. Characteristics of electrical equipment, deck-changing, pulley and ropes, and head-frame are given. (*EI*, 1961)

- 1,298. WIDE SPEED RANGE AND TORQUE CONTROL OF NEW CONTACTORLESS PRECISION D-C HOIST  
Hansen, A., Karlson, J. H., Mierendorf, R.  
*AIEE, Transactions of the, Part II—Applications and Industry*, v. 80, no. 53, paper 60-639, pp. 37-40, March 1961

Careful manipulation of control functions makes it possible to generate desirable motor characteristics utilizing a basically standard type of adjustable speed drive incorporating simple and rugged circuitry. Series or shunt motor characteristics can be employed for that part of work which they fit best. (*EI*, 1961)

1,299. SHAFT GUIDE REACTIONS AT NO. 2

ORE SHAFT MOUNT ISA  
MINES LIMITED

Allardice, J. G., Mercer, J. K.

*Australasian Institute of Mining and Metallurgy,  
Proceedings of the*, no. 197, pp. 225-238,  
March 1961

Shaft guide reactions have been reduced to a low order of magnitude by the use of self-aligning slippers and spring-loaded guide rollers. A Cambridge accelerometer was used to measure reactions and to confirm that progressive skip modifications were resulting in reduced reactions. (*EI*, 1961)

1,300. CONVERSION OF DRUM HOIST  
TO KOEPE FRICTION TYPE

Gronseth, J. R.

*Mining Congress Journal*, v. 47, no. 3,  
pp. 48-51, 69, March 1961

Converted Bristol mine hoists reach 250 ft deeper, and hoisting capacity has increased some 35%. PVC friction material has thus far given exceptional service and should permit two more 250-ft levels using flattened strand ropes. Increased loads on hoists and headframe were handled with minor reinforcing, and the misaligned shaft has not presented any tail rope problems. (*EI*, 1961)

1,301. ON LONGITUDINAL VIBRATION OF  
WINDING ROPES IN VERTICAL SHAFTS

Aida, T., Sato, S.

*Mining and Metallurgical Institute of Japan,  
Journal of the*, v. 77, no. 873, pp. 165-172,  
March 1961

Effects of a shock absorber on vibration are described, and influence of a tail rope or head sheave on vibration is discussed. A decrease of vibration due to friction between cage and guide is shown. (*EI*, 1961)

1,302. EPICYCLIC GEARS FOR MINE HOISTS

*The Engineer*, v. 211, p. 661, April 21, 1961

1,303. MERCURY-ARC CONVERTER-FED  
MINE WINDERS

Ellis, J., Waugh, A. M.

*Direct Current*, v. 6, no. 1, pp. 10-17, April 1961

Features are described of two hoists manufactured by the English Electric Co., Ltd., for Doornfontein and West Driefontein gold mines, South Africa. Direct current

drives are supplied by mercury-arc converter equipment with each hoist rated at 6000 hp. Details are given on the driving motor, mercury-arc converters, and the control system. (*EI*, 1961)

1,304. KRUPNYE SHAKHTNYE PODEMNYE

USTANOVKI V CHEKHOSLOVAKII (MAJOR  
MINE HOISTS IN CZECHOSLOVAKIA)

Davydov, B. I.

*Gornyi Zhurnal*, v. 137, no. 4, pp. 43-47,  
April 1961

Types of cages, guides, hoists, brakes, and electric equipment are described. (*EI*, 1961)

1,305. EFFICIENT HANDLING OF SHEET  
STEEL BY LIFTING MAGNETS

Kabus, K.

*Handling, Conveying, Automation —  
International* (English edition of *Foerdern und  
Heben*), no. 4, pp. 111-116, April 1961

Problems connected with sheet steel handling are discussed, and an explanation is given of the efficient use of lifting magnets. Rectangular and circular magnets, used singly or as multiple units, are included. (*EI*, 1961)

1,306. APPLICATION OF ELECTRICAL  
COMPUTING DEVICES TO MINE  
WINDER PROBLEMS

*Mining Journal*, v. 256, no. 6561,  
pp. 566-567, 569, May 19, 1961

1,307. DIE SENKRECHT-FOERDERUNG IN  
DER AUFBEREITUNG (VERTICAL  
CONVEYING IN PROCESSING)

Mueller

*Aufbereitungs-Technik*, v. 2, no. 5, pp. 202-206,  
May 1961

Vertical conveying in processing is discussed, and the advantages of using belt elevators are noted. With a new method, large and heavy buckets are attached to the belt by cold vulcanizing, and conveying capacity is thus increased. Further developments include elastic fastening of buckets to the belt and fixing of axles on the belt for guidance purposes. (*EI*, 1961)

1,308. PODEMNYE USTANOVKI SHAKHTY

"GIGANT-GLUBOKAYA" (MINE HOISTS  
OF "GIGANT-GLUBOKAYA" MINE)

Meleshkin, S. M.

*Gornyi Zhurnal*, v. 137, no. 5, pp. 46-48,  
May 1961

Data are given on the performance of multirope skip hoists, depending on the rate of hoisting. The arrangement of multirope winders and associated equipment is explained. (*EI*, 1961)

- 1,309. USTANOVKA DLYA DEFEKTOSKOPIII  
STALNYKH PODEMNYKH KANATOV  
(INSTALLATION FOR DETECTION  
OF DEFECTS IN HOISTING  
STEEL WIRE ROPES)  
Vizental, I. B., Siamashvili, Zh. G.  
*Gornyi Zhurnal*, v. 137, no. 5, pp. 49-50,  
May 1961

The article includes data on an apparatus designed to test wire rope independently of duration of wire rope service. An automatic recorder registers all broken wires and the change in rope diameter due to wear and tension. (*EI*, 1961)

- 1,310. SPECIAL FEATURES OF GALENA  
MINE HOIST INSTALLATION  
Visnes, N.  
*Mining Congress Journal*, v. 47, no. 5, pp. 30-33,  
May 1961

The adaptation to deep mining in loose heavy ground has required introduction of technical advances. A TV monitor allows the hoistman to observe two skips when they are in dump, and this has speeded up the hoisting cycle and removed all uncertainty from the dumping procedure. Flattened strand rope was used to meet an increased load and to resist crushing of multiple wrapping on drums. Experiments with the use of copper conductors in hoist ropes as the means of transmitting signals are described. (*EI*, 1961)

- 1,311. FORK LIFTING ATTACHMENT  
FOR POWER SHOVEL  
*The Engineer*, v. 211, p. 915, June 2, 1961

- 1,312. COMPUTERS AS AID TO ELECTRIC  
MINE WINDER DESIGN  
Killoran, F.  
*English Electric Journal*, v. 17, no. 2,  
pp. 31-42, June 1961

The use of an analog computer in the simulation of automatic control schemes to check stability and response in servo-controlled main drives is discussed with regard

to electric mine hoists. The determination of its optimum duty cycle is considered as well as calculations involved, shaft utilization, and safety problems. (*EI*, 1961)

1,313. ARRESTERS FOR OVERTRAVELED  
CONVEYANCES

Hallett, A. W. P.

*South African Mechanical Engineer*, v. 10,  
no. 11, pp. 293-322, June 1961

A hydraulic buffer is found to be capable of bringing mass to rest, whatever its velocity, and may be designed to give adequate retardation to a Koepe hoist, which does not permit separation of rope from conveyance in case of overwinding. (*EI*, 1961)

1,314. MOBILE WINDING ENGINES AND  
MULTI-LAYER ROPE SPOOLING

Coulshed, A. J. G.

*Mining Engineering*, v. 120, no. 10,  
pp. 820-826, July 1961

Problems connected with obtaining satisfactory rope spooling on a mobile hoist are discussed as well as steps taken to arrive at a system which gives uniform pyramidal spooling. Considered in the article are the towing vehicle, power pack, hoist engine unit, shaft transport facilities, rope fleet angle, siting or securing, and rope and pyramidal spooling. (*EI*, 1961)

1,315. AUTOMATIC SKIP HOIST INSTALLED  
AT FOUNDRY

*South African Mining and Engineering  
Journal*, v. 72, no. 3575, p. 337, August 11, 1961

From a railroad track hopper below grade level, coke or limestone travels 65 ft upward in an almost perpendicular path, then continues horizontally another 165 ft to unload into storage bins. Traveling at speeds between 65 and 130 ft/min, the capacity of the skip hoist is 9.2 tph of coke, with as many as 20 plus trips/hr. (*EI*, 1961)

1,316. LIFT TRANSFORMERS WITH QUICKLY-  
RIGGED PORTABLE HOIST

Miltenberger, C. E., Waeckerle, W. S.

*Electrical World*, v. 156, p. 88, August 28, 1961

1,317. MINE WINDING EQUIPMENT

Wilkinson, C. D.

*Institution of Electrical Engineers, Journal of the*,  
v. 7, no. 80, pp. 489-493, August 1961

Hoist systems employed in the United Kingdom are discussed. Reasons are stated for adoption of multirope

friction hoists during the past decade. Gears and brakes, ac and dc hoists, rectifier hoists, and safety devices are included in the discussion. (*EI*, 1961)

1,318. AIR MOTOR HOISTS AT A GLANCE

Ringer, A. G.

*Modern Materials Handling*, v. 16, pp. 82-83,  
August 1961

1,319. CORROSION INHIBITING COATINGS  
FOR MINE HOIST WIRE ROPE

Dingley, W.

*Corrosion*, v. 17, no. 9, pp. 22-23, 26-27,  
September 1961

Results of laboratory tests are given. After a preliminary screening test, a series of tests on zinc-coated wire from mine hoist rope, using various proportions of asphalt, zinc chromate and trichlorethylene, showed that coatings having asphalt to zinc chromate ratio of about 1:1 gave the best results. Asphalt-zinc chromate-trichlorethylene coating is recommended for both used and unused ropes. (*EI*, 1961)

1,320. OPERATIONAL CHARACTERISTICS  
OF HYDRAULIC LIFTS

Dettinger, W.

*Handling, Conveying, Automation —  
International (English edition of Foerdern und  
Heben)*, no. 9, pp. 344-348, September 1961

Studies show that 15- to 30-atm operating pressures of currently built hydraulic lifts are far below optimum theoretical pressures of 100 to 150 atm. The latter may be applied with present day engineering techniques to take full advantage of hydraulic lifting systems and make them competitive with rope winch hoists. (*EI*, 1961)

1,321. PERMANENT MAGNETS: SIMPLEST  
ANSWER TO TRICKY HANDLING  
PROBLEMS

*Mill and Factory*, v. 69, pp. 95-99,  
September 1961

1,322. INTRODUCTION TO FRICTION WINDING

Choudhury, N. P. R.

*Mining, Electrical and Mechanical Engineer*,  
v. 42, no. 491, pp. 86-89, September 1961

General types of hoist systems are given. The uses of friction hoists in Germany and Great Britain are detailed.

Included in the article are the advantages and disadvantages of equipment and techniques such as ropes, drums, electrical drive systems, ground and tower types, rope slip design, counterweights, and differential-type pulley. (*EI*, 1961)

1,323. CONVENIENT MINE HOIST ANALYSIS

Brune, A. W.

*Mining Engineering*, v. 13, no. 9,  
pp. 1059-1061, September 1961

The method of calculating duty cycles of mine hoists by the tabulation of the factors involved permits a ready evaluation of the problem. Calculations for both cylindrical and conical drums are presented. (*EI*, 1961)

1,324. CONTROLLED SWIVEL FOR  
WIRE ROPES

Seetharam, A.

*Mines Magazine*, v. 105, no. 3, pp. 137-150,  
September 1961; no. 4, pp. 208-213, October 1961

Experience with deep mine hoists in the Kolar gold field is detailed. Attention is given to torsion in stranded steel wire ropes when newly installed on a hoist, and evolution of controlled swivel from experience gained with different methods adopted for release of twist in such ropes. The testing and performance of ropes are reported. (*EI*, 1961)

1,325. REINFORCED PISTON LIFTS  
JET ENGINE

*Hydraulics and Pneumatics*, v. 14, pp. 26+,  
October 1961

1,326. DIESEL-ELECTRIC LIFT TRUCK

*Machine Design*, v. 33, pp. 134-135,  
November 23, 1961

1,327. WIRE ROPE SPOOLING-METHOD  
AND PRACTICES

Thompson, L.

*Mining Congress Journal*, v. 47, no. 11,  
pp. 63-66, November 1961

Three basic patterns of spooling wire rope in use today are: helical spooling, single crossover parallel spooling, and double or two-crossover parallel spooling. The use of plain and grooved drums is discussed as well as factors to consider in selecting the method of grooving and the proper pitch of groove. The improper fleet angle and

lack of proper line tension can cause improper spooling and less wire rope service. Selection of correct wire rope is discussed. (*EI*, 1961)

**1,328. DESIGN OF CONCRETE HEADFRAMES FOR SOUTH AFRICAN GOLD MINES**

Backeberg, A. C.

*Mining Engineering*, v. 13, no. 11,  
pp. 1241-1242, November 1961

Basic conditions of loading to be considered in the design of reinforced concrete headgear in South Africa are discussed. Specifications for dead load, rope loads, live loads, and wind loads are presented, and the design and construction of two concrete headframes in South Africa are described. (*EI*, 1961)

**1,329. IMPROVEMENTS IN OR RELATING TO FLUID-OPERATED PICK-UP**

MECHANISMS

Friars, F. W., Knights, H. C.

December 28, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 885,707 (assigned to United Kingdom Atomic Energy Authority)

A pick-up mechanism of the type described in British Patent 808,736 for the manipulation of irradiated fuel elements submerged in a deep pond is improved. The improvements consist of supporting the outer tube of the telescopic pair of tubes pivotally in a movable carrier instead of by a float, and providing a longitudinal keying to prevent relative rotary movement between the tubes while permitting axial movement. (*NSA*, 1962, #5449)

**1,330. RECOMMENDED PROCEDURES FOR MINE HOIST AND SHAFT INSTALLATION, INSPECTION, AND MAINTENANCE**

Walker, W. D., Jr., Stahl, R. W.  
1961

U.S. Department of the Interior, Bureau of Mines, Washington, D.C.  
Information Circular 8031

The construction and installation of hoists (cage, skip, or bucket), position indicator, ropes, head sheaves, shaft, and guides are discussed. Recommendations are made for inspection and maintenance on a daily, weekly, and bimonthly basis. (*EI*, 1961)

- 1,331. **LET MAGNETS BOOST YOUR HANDLING EFFICIENCY**  
Faller, W. J.  
*Food Engineering*, v. 34, pp. 80-81,  
January 1962

- 1,332. **BUTTE DEVELOPS SAFETY PRECAUTIONS FOR RAISE CLIMBERS**  
Colvin, L. P.  
*Mining Engineering*, v. 14, pp. 35-37,  
January 1962

- 1,333. **LIFT SPEEDS FREIGHT**  
*Product Engineering*, v. 33, p. 93,  
February 19, 1962

- 1,334. **IMPROVEMENTS IN OR RELATING TO MECHANICAL HANDLING EQUIPMENT INCLUDING A CARRIAGE AND A GRAB**  
Langdon, K. T. P.  
February 21, 1961  
U.S. Department of Commerce, Washington, D.C.  
British Patent 889,709 (assigned to Babcock and Wilcox, Ltd.)

Mechanical handling equipment is designed for removing debris from the pressure vessels of gas-cooled, graphite-moderated reactors. The equipment includes a carriage and a grab for raising and lowering a load mounted on the carriage. The carriage is arranged to carry a load-supporting means which is projectable to an advanced position below the grab. (*NSA*, 1962, #13,194)

- 1,335. **NEW LIFT TRUCK IDEA**  
*Iron Age*, v. 189, p. 62, February 22, 1962

- 1,336. **PERFORMANCE CHARACTERISTICS OF THREE SMALL COMPRESSED AIR HOISTS**  
Walker, G., Casey, W.  
*The Engineer*, v. 213, pp. 354-357,  
February 23, 1962

- 1,337. **SIX-TON WINCH WITH INCHING CONTROL**  
*The Engineer*, v. 213, p. 373, February 23, 1962

- 1,338. **SAFETY FOR A BIG LIFT**  
*Safety Maintenance*, v. 123, pp. 13, 17,  
February 1962

- 1,339. CRANE HOIST DYNAMIC-BRAKING  
CONTROL SCHEMES WITH A-C POWER  
Kuka, K. S.  
*Iron and Steel Engineer*, v. 39, pp. 77-85,  
February 1962

- 1,340. SIDE-LOADING FORK LIFT TRUCK  
*The Engineer*, v. 213, p. 458, March 9, 1962

- 1,341. IMPROVEMENTS IN OR RELATING  
TO HOISTING DEVICES  
Sidebottom, W. J., Fletcher, L. M., Lewis, R. A.  
March 28, 1962  
U.S. Department of Commerce, Washington, D.C.  
British Patent 892,603 (assigned to United  
Kingdom Atomic Energy Authority)

A hoist is designed for lowering an ion chamber from a branch pipe in a reactor pressure vessel into the core for neutron flux measurements. The hoist comprises a tubular housing, a winding drum disposed therein, and pulley and guide means for winding or unwinding the cable on or from the drum. The drum is arranged with its axis parallel to that of the housing, so that the housing is compact and can be accommodated in a standpipe.  
(NSA, 1962, #13,197)

- 1,342. WEB AND REEL TENSIONERS  
[DRAWINGS WITH TEXT]  
Kasper, L.

*Machine Design*, v. 34, pp. 135-137,  
March 29, 1962

- 1,343. A HIGH-PERFORMANCE ELEVATOR  
CONTROL SYSTEM  
Oplinger, K. A., Bobula, L. A., Lund, A. O.,  
Ostrander, W. M.  
*Electrical Engineering*, v. 81, pp. 187-193,  
March 1962

- 1,344. HYSTER LIFT TRUCKS DESIGNED  
FOR EFFICIENCY  
*Steel*, v. 150, pp. 103-104, May 28, 1962

- 1,345. IMPROVEMENTS IN OR RELATING TO  
NUCLEAR REFUELLED MACHINES  
Knights, H. C.  
May 30, 1962  
U.S. Department of Commerce, Washington, D.C.  
British Patent 897,453 (assigned to United  
Kingdom Atomic Energy Authority)

A hoisting chain arrangement for raising irradiated fuel elements from a reactor is designed with leads for connection to thermocouple leads on the fuel elements for temperature indication. (NSA, 1962, #1753)

- 1,346. 1962 MATERIALS HANDLING AND  
PACKAGING DIRECTORY: OVERHEAD  
EQUIPMENT  
*Modern Materials Handling*, v. 17, pp. 275-308,  
May 1962

## CONVEYING MECHANISMS AND EQUIPMENT

1,347. PNEUMATIC HANDLING SYSTEMS  
SOLVE PROBLEMS OF MOVING  
BULK MATERIAL

Weller, L. G.

*Automation*, v. 5, no. 1, pp. 69-74, January 1958

Handling problems are discussed for production processes that consume dry solid materials in pelletized, granulated or pulverized state. Three basic types of pneumatic handling systems are covered, and the means by which they provide automated solutions to these problems is shown. Examples are given of starch handling in a textile plant, handling of flour in a bakery, and phenolic resin and cellulose acetate compounds in a telephone set manufacturing plant. (*EI*, 1958)

1,348. BULK MATERIAL SLINGER

*Automation*, v. 5, p. 68, February 1958

1,349. MAGNETS CUT CONVEYOR COSTS

*Steel*, v. 142, p. 120, April 7, 1958

1,350. GIVE CONVEYORS AUTOMATION WITH  
MECHANIZED HANDLING

LeVeque, F. I.

*Iron Age*, v. 183, pp. 104-106, June 18, 1959

1,351. PALLET TRANSPORTER TRIMS  
MANHOUR COSTS

*Steel*, v. 144, p. 97, June 22, 1959

1,352. AVTOMATICHESKIE DOZATORY  
NEPRERYVNOGO DEISTVIYA  
(CONTINUOUS AUTOMATIC DOSING  
APPARATUS)

Malkov, A. P.

*Metallurgia*, v. 4, no. 6, pp. 8-10, June 1959

The design of a gravity conveyor with automatic dosing apparatus is discussed. The apparatus is suitable for dry substances in coking, ore dressing, and other plants. A working diagram is presented as well as tabular data of characteristics of six types of dosing devices. (*EI*, 1961)

1,353. USE GRAVITY FOR BETTER STORAGE  
*Mill and Factory*, v. 65, no. 2, pp. 96-97,  
August 1959

Factors are discussed which govern the use of an inclined wheel on a roller conveyor for live storage installation. This installation permits the handling of mixed package sizes, saves time and labor costs, simplifies inventory taking, order picking and assembly, and makes better use of warehouse cubage. (*EI*, 1960)

1,354. SELECTION AND USE OF PNEUMATIC  
CONVEYORS

Sayre, H. S.

*Material Handling Engineering*, v. 14, no. 12,  
pp. 66-69, 130-133, September 1959

Pneumatic conveying will increase productivity, save time and lower costs. An outline of three basic systems—low, medium, and high pressure—is given. Several material feeders are listed and described briefly. (*EI*, 1960)

1,355. NEW RIO HAINA FACILITY IN  
OPERATION

*Sugar y Azucar*, v. 54, no. 9, pp. 32-33,  
September 1959

The layout of raw sugar bulk storage and ship loading facilities in the Dominican Republic is reviewed. Chain conveyors transport sugar from centrifuges to vertical bucket elevators; belt conveyors are used within the warehouse and for transport to dock; shop loading units transfer 550 tph to ship hatches. (*EI*, 1960)

1,356. TROUGHING IDLER BELT CONVEYOR  
STRUCTURE

*The Engineer*, v. 208, p. 486, October 23, 1959

1,357. TEKHNIKO-EKONOMICHESKAYA  
EFFEKTIVNOST PRIMENENIYA  
MAGISTRALNOGO GIDRAVLICHESKOGO  
TRANSPORTA POLEZNYKH  
ISKOPAEMYKH (TECHNICAL AND  
ECONOMIC EFFICIENCY OF APPLYING  
HYDRAULIC TRANSPORTATION OF  
MINERALS THROUGH MAIN PIPELINES)  
Khuan, T.-T., Smoldyrev, A. E.  
*Ugol*, v. 34, no. 10, pp. 8-13, October 1959

A method is given for comparing different kinds of transportation limits of efficient application of hydraulic transportation. Factors determining costs of hydraulic transportation and economic distances for hydraulic handling of coal, iron, ore, and sand are discussed. (*EI*, 1960)

1,358. NEW BELT PERMITS 45° IDLERS FOR ORES

*Engineering and Mining Journal*, v. 160, p. 102, October 1959

1,359. PNEUMATIC CONVEYOR SPEEDS SAND DELIVERY

*Foundry*, v. 87, p. 154, October 1959

1,360. PNEUMATIC CONVEYERS

Fischer, J.  
*Mechanical Engineering*, v. 81, pp. 67-69, November 1959

1,361. PNEUMATIC HANDLING OF DRY CHEMICALS AT A SMALL WATER TREATMENT PLANT: DRACCO AIRSTREAM CONVEYOR

*Public Works*, v. 90, p. 162, November 1959

1,362. MOBILE PNEUMATIC HANDLING PLANT

*The Engineer*, v. 208, p. 868, December 25, 1959

1,363. PNEUMATIC CONVEYANCE AND CONTINUOUS FLUIDIZATION OF SOLIDS

Gopichand, T., Sarma, K. J. R., Rao, M. N.  
*Industrial and Engineering Chemistry*, v. 51, pp. 1449-1452, December 1959

1,364. THEORETISCHE UND EXPERIMENTELLE UNTERSUCHUNGEN UEBER DIE DRUCKVERLUSTE PNEUMATISCHER FOERDERLEITUNGEN, ETC.  
(THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF PRESSURE LOSS IN PNEUMATIC CONVEYORS, WITH SPECIAL ATTENTION TO EFFECTS OF FRICTION AND WEIGHT OF SOLIDS IN CONVEYOR)

Muschelknautz, E.  
*Verein Deutscher Ingenieure—Forschungsheft*, v. 476, 1959 (32 pp.)

The development of theory and theoretical equations is traced. Experimental investigations of behavior of solid particles striking conveyor walls are reported. Computed values are compared with literature data for wheat, coal washery refuse, quartz, and glass balls. 32 references. (*EI*, 1960)

1,365. MANUTENTION DES CASIERS, CAISSES, COLIS ET PIECES DIVERSES (HANDLING OF BINS, CRATES, PACKAGES AND MISCELLANEOUS ITEMS)

Chamouard, A.  
*Technique Moderne*, v. 52, no. 2, pp. 28-32, February 1960

General principles of construction and operation, and scope of application are discussed for gravity conveyors, belt relays, conveyors with driven rollers, chain and pallet conveyors, belt conveyors with raising and lowering devices, bar-type raising and lowering machines, "pater-noster" or plate-type elevators, balance-type elevators, and mobile equipment. (*EI*, 1960)

1,366. MANUTENTION PNEUMATIQUE DES MATIERES EN VRAE (PNEUMATIC HANDLING OF BULK MATERIAL)

*Technique Moderne*, v. 52, no. 2, pp. 84-90, February 1960

Various types of pneumatic handling equipment are discussed. Fundamental principles of suction, blowing, and a combination of both are reviewed with reference to specific installations for conveying of grain, textile materials, powdered coal, and other bulk materials. Use of blown air for unloading of containers and tank trucks is described. (*EI*, 1960)

1,367. PHYSIKALISCHE UND WIRTSCHAFTLICHE PROBLEME DES TRANSPORTES VON FESTTEILCHEN IN FLUESSIGKEITEN UND GASSEN (PHYSICAL AND ECONOMIC PROBLEMS IN CONVEYING SOLID PARTICLES IN LIQUIDS AND GASES)

Barth, W.  
*Chemie-Ingenieur-Technik*, v. 32, no. 3, pp. 164-171, March 1960

Pneumatic and hydraulic conveying plants are characterized by low plant costs and small space requirements. In general, however, operating costs are higher than in classical methods of conveying. For economy of energy,

low conveying velocities and high solids ratio in the region of "stoppage limit" should be used. (*EI*, 1960)

**1,368. BULK SALT STOCKPILE HANDLING**

Beskine, J. M.

*Mechanical Handling*, v. 47, no. 3, pp. 138-142,  
March 1960

Design, construction, and layout are described for the Crone & Taylor installation at Runcorn Salt Works of Imperial Chemical Industries, Ltd., Cheshire. This installation employs a cross-conveyor and a reversible shuttle conveyor (both of which can span a warehouse) and throwers. The system is also applicable to coal and coke, chemicals, sugar, and other raw materials handling. (*EI*, 1960)

**1,369. ERFAHRUNGEN MIT EINEM  
FALTENBAND IN DER AUFBEREITUNG  
(EXPERIENCE WITH A FOLDED  
BELT IN PROCESSING)**

Klinkenborg, G.

*Aufbereitungs-Technik*, v. 1, no. 4, pp. 189-192,  
April 1960

A folded belt is a conveyor consisting of individual parts 960-1500 mm long and 500-1400 mm wide. At certain intervals, sheet proppings are vulcanized under the belt to give it stiffness and trough shape; the chain is connected with proppings and receives traction forces. The conveyor can be used as a curved belt or steep conveyor; it is especially suited for the conveying of granulate, pellitized, and sticky material. (*EI*, 1960)

**1,370. SYMPOSIUM: PNEUMATISCHE TRANSPORT  
(SYMPOSIUM ON PNEUMATIC  
CONVEYING)**

*Ingenieur*, v. 72, no. 26, pp. Ch83-95,  
June 24, 1960; no. 36, pp. Ch111-119,  
September 2, 1960; no. 38, pp. Ch121-136,  
September 16, 1960; no. 47, pp. Ch137-140,  
November 18, 1960

Among the papers presented at this symposium were the following:

"Introduction," by J. G. Slotboom, Ch83-87; "Practical Experiences in Pneumatic Conveying," by J. F. Clausen, H. Zuidervaart, Ch88-92; "Method To Determine Quantities of Pulverized Material in Pneumatic Conveying Line," by J. Wijthoff, Ch92-95. (no. 26, June 24, 1960)

"Feeding of Pneumatic Conveyors," by H. A. Leniger, Ch111-116; "Continuous Addition of Pulverized Mate-

rial Which Can Be Fluidized," by J. Wijthoff, Ch116-117; "Some Structural Experiments," by H. J. A. Span Ch117-119. (no. 36, September 2, 1960)

"Pneumatic Conveying of Fine Cracking Catalyst in Vertical," by S. Stemerding, Ch121-126; "Pneumatic Conveying of Fluid Cracking Catalysts in Fluidized State," by J. Wijthoff, Ch126-128; "Horizontal Pneumatic Transport of Coarse Grains," by C. W. J. van Koppen, Ch128-134. (no. 38, September 16, 1960)

"Collection of Material," by H. van der Kolk, Ch137-140. (no. 47, November 18, 1960) (*EI*, 1960)

**1,371. EINE PNEUMATISCHE ANLAGE FUER  
TONERDE-PULVER (PNEUMATIC  
EQUIPMENT FOR ALUMINA POWDER)**

Bushell, E., Maskell, R. C.

*Aufbereitungs-Technik*, v. 1, no. 6, pp. 259-263,  
June 1960

Fluidized handling of alumina powder is discussed. Alumina powder is handled by Fluidair air conveyors which are 20 in. wide and consist of a lower 3 in. deep flanged trough and an upper 10 in. deep inverted trough. Tiles separate the sections into two spaces—the space above tile carries alumina; and the space below tile is supplied with air provided by centrifugal blowers. (*EI*, 1960)

**1,372. APPLICATION OF LINEAR INDUCTION  
MOTORS TO CONVEYORS**

Laithwaite, E. R., Tipping, D.,  
Hesmondhalgh, D. E.

*Institution of Electrical Engineers, Proceedings  
of the, Part A—Power Engineering*,  
v. 107, no. 33, pp. 284-294, June 1960

The principal advantage in using linear induction motors to drive conveyor belts is that force can be applied uniformly to the belt over a wide area without mechanical contact, and that the drive is independent of coefficient of friction between belt and rollers and belt stretch is less likely to occur. Two systems based on this principle are discussed; the first uses a woven copper belt and the second is a series of solid plates connected to chains along each side. (*EI*, 1960)

**1,373. PNEUMATIC CARRIER ROUTED  
BY ACOUSTICS**

Landon, N.

*Product Engineering*, v. 31, p. 15, July 11, 1960

- 1,374. AUTOMATIC HANDLING IN ELECTRIC LAMP PRODUCTION  
Sanders, P. M.  
*Mechanical Handling*, v. 47, no. 7, pp. 462-465,  
July 1960

A description is given of the operational sequence of endless chain conveyors equipped with 110 hangers, at 5-ft 4-in. centers, that carry steel framed aluminum trays each perforated with six rows of nine holes to support 54 bulbs in an inverted upright position. At Osram lamp-works of General Electric Co., Ltd., the system carries 20,000 bulbs/hr from the ground floor to the second floor, saving handling time, saving space, and reducing breakage. (*EI*, 1961)

- 1,375. COMPUTER CONVEYOR AUTOMATES SHIPPING  
*Mill and Factory*, v. 67, p. 118, July 1960

- 1,376. BODY TRIM TRACKS AT LONGBRIDGE  
Cleas, A. G. D.  
*Mechanical Handling*, v. 47, no. 8, pp. 538-542,  
August 1960

Longbridge, Birmingham factory of Austin Motor Co., Ltd., uses five tracks, each comprising twin slatted conveyors on 4-ft centers and having common drive and tensioning mechanisms. Car bodies are loaded at the drive end and unloaded at the tension end by fully automatic electric lifts situated between turn slatted conveyors. The drive unit is housed below floor level; the operating cycle at load end. (*EI*, 1961)

- 1,377. POWER-AND-FREE CONVEYOR COMBINATION  
*Mechanical Engineering*, v. 82, p. 64,  
August 1960

- 1,378. COMPLEX CONVEYOR SIMPLIFIES PRODUCTION  
*Engineering*, v. 190, p. 314, September 2, 1960

- 1,379. CHIP REMOVER ACCENTS SAFETY: VACUUM UNITS  
Gibbons, G. D., Elder, J. A.  
*Iron Age*, v. 186, pp. 102-103, September 22, 1960

- 1,380. AUTOMATIC VACUUM SYSTEM PIPES BULK MATERIALS  
Bast, C. H.  
*Control Engineering*, v. 7, no. 9, pp. 197-198,  
September 1960

A control system was recently installed at Backus & Johnston Brewery in Lima, Peru. Two vacuum-type pneumatic systems—designated the unloading system and the reclaiming system—provide clean, safe transfer of whole malt, rice, and black malt. (*EI*, 1960)

- 1,381. NEW DRIVES SHARPEN CONVEYOR SYNCHRONIZATION  
Maag, R. B.  
*Control Engineering*, v. 7, no. 9, pp. 192-193,  
September 1960

- 1,382. PNEUMATIC SYSTEM SPEEDS TRAILER LOADING AND UNLOADING  
*Automation*, v. 7, no. 9, pp. 78-79,  
September 1960

A self-powered mechanized conveyor system is described which was developed by Alvey Conveyor Mfg. Co. This system can be installed in a 32-ft trailer so that the trailer can be fully loaded or unloaded in 1½ min. Palletized materials that can be handled include paper, baled goods, metal ingots, and cartons of bottles and cans. (*EI*, 1960)

- 1,383. HANDLE ON SPOT WITH PORTABLE CONVEYORS  
*Material Handling Engineering*, v. 15, no. 12,  
pp. 89-92, September 1960

Features and applications are given for carry- and portable-type conveyors such as gravity wheel, gravity roller, and powered (gas or electric) belt conveyors. Portable slat conveyors handle loads up to 800 lb and portable package conveyors handle up to 500-lb packages. The portable flat belt conveyors handle coal, coke, and cinders. (*EI*, 1961)

- 1,384. NEUZEITLICHE FOERDERANLAGEN IN DER DUENGMITTEL-INDUSTRIE (MODERN CONVEYING EQUIPMENT FOR THE FERTILIZER INDUSTRY)  
Seiler, W.  
*Schweizerische Bauzeitung*, v. 78, no. 40,  
pp. 645-650, October 6, 1960

A description is given of a new "through-chain-forwarder" comprising endless chain elements movable within a closed cut and provided at each link either with crosswise bilaterally extending bars or other members. This device conveys material fed into a duct at one end to an opening at the other end, keeping it clean and preventing losses by dusting. Examples of vertical, horizontal, and inclined applications are presented as well as multiple applications. Hot material conveying and cooling are discussed. (EI, 1961)

**1,385. SYNCHRONIZATION OF ADJACENT CONVEYORS**

*Machine Design*, v. 32, p. 175, October 13, 1960

**1,386. SPRING-LOADED TRIGGER WHEELS IN CONVEYOR DEVELOPED BY RAPIDS-STANDARD CO.**

*Machine Design*, v. 32, p. 114, October 27, 1960

**1,387. MOVE BULK MATERIALS MECHANICALLY**

Fischer, J.

*Material Handling Engineering*, v. 15, no. 13, pp. 72-74, October 1960

Features are described of (1) continuous conveyors for handling carbon black, flour, plastics, powders or grains, (2) trough belt conveyors for large lumps or fine powders, (3) screw or spiral conveyors for cornstarch or pebbles, slurries and coal, (4) apron conveyors for bulky or hot materials, sand, scrap metal, forgings and castings, and (5) bucket elevators for any loose material from very fine to large lumps. (EI, 1961)

**1,388. SERVO CONTROL FOR SYNCHRONIZED CONVEYORS**

Lewis, A. E.

*Electrical Engineering*, v. 79, no. 10, pp. 832-835, October 1960

An electric control system for a conveyor system used in the automotive industry is described, many features of which may be used in other applications. Speed regulator, position compensation, interlocking and limit control, and master speed control are discussed. (EI, 1961)

**1,389. FINAL PRODUCT CONVEYOR SYSTEM**

Phillips, R. H., Solecki, J. E.

*Western Electric Engineer*, v. 4, no. 4, pp. 8-13, October 1960

An almost completely automatic large conveyor complex is used for transportation of completed telephone sets of great variety, from assembly areas of Western Electric's Indianapolis Works to another building. Sorting by code into pallet loads of cases is included. (EI, 1961)

**1,390. TESTS WITH VERTICAL SCREW CONVEYORS**

*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 10, pp. 33-34, October 1960

A study is presented of effect of variation of shape and size of inlet, diameter of worm shaft, angle of inclination, and other factors on degree of filling. Mass conveyed, and power requirements for optimum performance of screw conveyors are discussed. (EI, 1961)

**1,391. CAUSES OF HANGING IN ORE CHUTES**

Aytaman, V.

*Canadian Mining Journal*, v. 81, no. 11, pp. 77-81, November 1960; no. 12, pp. 71-75, December 1960; v. 82, no. 1, pp. 41-45, January 1961

The flow of dry granular sand in vertical pipes is discussed, and arching effects due to exerted pressure are described. Arching under body loading conditions, force transmission in free-flow range, equilibrium and flow of fragmented particles, and theory of particle arches are discussed. (EI, 1961)

**1,392. SANDWICH CONVEYOR—SOLUTION FOR STEEP BELT TRANSPORTATION**

Rasper E. H. L., Rasper, P.

*Engineering and Mining Journal*, v. 161, no 11, pp. 100-103, November 1960

A sandwich conveyor, utilizing overhead cover belt and friction pressure roller conveyors, can work at angles up to 45 deg. This conveyor will also handle light, poorly sorted, or wet material. (EI, 1961)

**1,393. STUDY OF SCREW CONVEYOR**

Uematsu, T., Nakamura, S.

*J.S.M.E. (Japan Society of Mechanical Engineers) Bulletin*, v. 3, no. 12, pp. 449-455, November 1960

A study is presented in which theoretical values of power and efficiencies are found to be in good agreement with experimental values, when screw shape and material

behavior are assumed to be close to real phenomena to simplify calculations. Experiments reveal that there is an optimum ratio of pitch to outer diameter of screw and that tip clearance must be reduced as much as possible. (EI, 1961)

1,394. PNEUMATIC SYSTEM UNLOADS

BULK CLAY

*Automation*, v. 7, p. 86, November 1960

1,395. OPEN TOP CONVEYOR MOVING SOLID MATERIAL USES AIR AT LESS THAN 1/10 PSI

*Factory*, v. 67, p. 142, November 1960

1,396. POWER- AND FREE-CONVEYOR LINES SPEED AUTOTYPE ASSEMBLIES

*Iron Age*, v. 186, pp. 62-63, December 22, 1960

1,397. MINIMIZING MAINTENANCE ON BELTS

Cassells, C. W., Kamp, E. J.

*Modern Materials Handling*, v. 15, no. 12, pp. 78-79, December 1960

A discussion is presented of 19 points to consider in specifying, installing, and maintaining belts for bulk handling, which will aid in obtaining longer belt life and lower operating costs. (EI, 1961)

1,398. TRANSPORT CONTINU PAR CANALISATION MOBILE (CONTINUOUS TRANSPORTATION BY MEANS OF MOBILE PIPING)

Hubert, J.

*Annales des Mines*, no. 12, pp. 53-66, December 1960

A device has been developed in which materials are carried in a pipe 1 or 2 km long, attached to a rail by wheels, 10% of which are driven by a 2-hp electric motor and powered by a three-phase line running close to the rail. Pipes follow one another at intervals of approximately 500 m and at 25 km/hr. This type of transportation is adequate for materials of low viscosity. (EI, 1961)

1,399. DOCK-CONVEYOR SYSTEM PRELOADS TRUCKS FAST

Mischou, J. L.

*Food Engineering*, v. 32, pp. 80-81, December 1960

1,400. PNEUMATIC CONVEYING

Richardson, J. F., McLeman, M.

*Institution of Chemical Engineers, Transactions of the*, v. 38, no. 5, pp. 257-266, 1960

Solids velocities and pressure gradients in a 1-in. horizontal pipe are considered. Accurate measurements are given of pressure drop obtained over a 70-ft length of pipe line in which particles were fully accelerated. Solids are classified according to variation of relative velocity between air and solids. The differences are associated with variations in size distribution. (EI, 1961)

1,401. HYDRAULIC CONVEYING OF SOLID MATERIALS IN PIPE LINES

Redeker, A.

*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 1, pp. 19-24, January 1961

Details are given of the present state of hydraulic conveying and research work in the United States, the Soviet Union, and Europe. A review of theoretical principles of horizontal and vertical mass transfer in pipe lines covers power consumption, velocity, specific weight, and friction ratios. A survey of available pumps, rotary vanes, feeders, ejectors, and feed sluices is presented, giving advantages, disadvantages, and economic analyses. (EI, 1961)

1,402. SPILL-PROOF COUPLER IN PNEUMATIC CONVEYOR SYSTEM

*Plastics World*, v. 19, p. 59, January 1961

1,403. CONTRIBUTION À L'ÉTUDE DU RÉGIME PERMANENT DES TENSIONS DANS LA COURROIE D'UN TRANSPORTEUR À BANDE CAOUTCHOUTÉE (CONTRIBUTION TO THE STUDY OF STEADY STATE OF TENSIONS IN THE BELT OF A RUBBER BELT CONVEYOR)

Dumontel, P.

*Revue de l'Industrie Minérale*, v. 43, no. 2, pp. 94-102, February 1961

The sum of tensional forces acting on the belt determines tension or horizontal force which has to be exerted in order to set the belt in motion. Formulas developed to evaluate horizontal force are given. Results of calculations are in good agreement with experimental measurements. (EI, 1961)

1,404. LETTER SHOOTS WITH REVERSING OPERATIONS

Tonne, F.

*Handling, Conveying, Automation—*

*International* (English edition of *Foerdern und Heben*), no. 2, pp. 58-61, February 1961

A study shows that a single-tube transmission system, for capsules with documents, that functions in both directions, is cheaper to operate than a two-tube system. Statistical data on a single-tube system with 24 dispatching-receiving stations are presented. (*EI*, 1961)

1,405. NOVEL PLATE PREPARATION SCHEME

*Shipbuilder and Marine Engine-Builder*, v. 68, no. 638, pp. 108-109, February 1961

A new system at Pallion shipyard of Short Bros., Sunderland, uses some 800 inverted casters set on declivity of  $\frac{1}{2}$  in. to 1 ft for moving steel plates up to  $3\frac{1}{4}$  tons in weight through processing. Each of two transporters can be elevated by pneumatic control, and a plate is arrested by a simple foot operated device. Each processing bay is provided with a working platform which can be raised or lowered pneumatically to provide a level working surface. (*EI*, 1961)

1,406. LOAD SENSING CONVEYOR PREVENTS CONTAINER PILEUPS

Falcon, C. J.

*Automation*, v. 8, no. 3, pp. 78-80, March 1961

A new type of conveyor, developed by the Rapids-Standard Co., is described. Operation of the conveyor is based on the principle that the leading container on the conveyor depresses sensing wheels and causes the following container to halt temporarily. Most successful applications are where long accumulation occurs and where articles handled are uniform in size and weight, and where length of article is nearly that of spacing between sensing devices. (*EI*, 1961)

1,407. STORING AND RETRIEVING STOCK; MECHANIZED SYSTEM FETCHES AND CARRIES

Heslen, R.

*Tool and Manufacturing Engineer*, v. 46, pp. 75-76, March 1961

1,408. AUTOMATIC IN-FLOOR CHAIN CONVEYOR SYSTEM

Hick, W.

*Handling, Conveying, Automation—*  
*International* (English edition of *Foerdern und Heben*), no. 3, pp. 94-96, March 1961

A system consisting of two branch strands linked to one main strand by automatic switches is used to transport semi-finished automotive parts from outside suppliers to the plant. Carriers are hand lift trucks equipped with special attachments. The system has a capacity of 72 trucks/hr in each direction. (*EI*, 1961)

1,409. PNEUMATIC AND HYDRAULIC MATERIAL HANDLING SYSTEMS IN THE STEEL INDUSTRY

Mylting, L. E.

*Iron and Steel Engineer*, v. 38, pp. 107-12, March 1961

1,410. THREE-STATION TRANSFER-MATIC

*Mechanical Engineering*, v. 83, p. 67, March 1961

1,411. HIGH-PRESSURE PNEUMATIC CONVEYING SYSTEMS AT CROWN ZELLERBACH CORP.'S SAWMILL

*Paper Industry*, v. 41, p. 882, March 1961

1,412. WOOD CHIPS TAKE OFF THROUGH SPIRAL PIPE VACUUM SYSTEM

*Plant Engineering*, v. 15, pp. 142-143, March 1961

1,413. CONVEYOR LINES SPEED ASSEMBLY OF PRECISION INSTRUMENTS

*Iron Age*, v. 187, pp. 108-109, April 6, 1961

1,414. MATCH MATERIAL TO SYSTEM FOR SUCCESSFUL PNEUMATIC CONVEYING

Stoess, H. A., Jr.

*Material Handling Engineering*, v. 16, no. 4, pp. 60-61, April 1961

Considerations and tables to be used as a guide in selecting a pneumatic conveyor are presented. (*EI*, 1961)

1,415. SAND HANDLING BY AIR CONVEYORS

Zimnawoda, H. W.

*Foundry*, v. 89, no. 4, pp. 76-80, April 1961

Flexibility and space savings are offered by pneumatic systems which move sand efficiently before or after mull-

ing, over long distances. The basic layout of such a system is described. Additional layouts are discussed which deal with new and prepared sand and illustrate combination systems of belt and air conveyors. (EI, 1961)

**1,416. MAGNETIZED ELEMENTS CONTROL CONVEYOR DISPATCHING SYSTEM**  
*Automation*, v. 8, no. 4, pp. 70-72, April 1961

A dispatching system is discussed for use with vertical and horizontal conveyors for routing carriers and/or products to selected stations. Unusual system flexibility is provided since address writing and address reading stations are not physically connected with each other. (EI, 1961)

**1,417. MATERIALS RIDE ON CUSHIONS OF AIR**  
*Mill and Factory*, v. 68, pp. 118-119, April 1961

**1,418. PREVENTING MICROBIAL DESTRUCTION OF CONVEYOR BELTING**  
Neale, A. E. T.  
*Mine and Quarry Engineering*, v. 27, no. 5, pp. 232-234, May 1961

Since service damage renders the textile core of a conveyor belt vulnerable to microbial deterioration, the "unprotected" belt is safe only while outer coating is intact. While simple waterproofing of fabric is inadequate, inclusion of a suitable microbicidal agent in the belt protection compound is sufficient to meet conditions of exposure found in most mining installations. (EI, 1961)

**1,419. VERSATILE CONVEYOR, FRIEND OR FOE?**  
*Engineering*, v. 191, p. 837, June 16, 1961

**1,420. TRANSPORTATION OF SOLIDS IN CONDUITS — INDUSTRIAL APPLICATION POSSIBILITIES**  
Condolios, E., Couratin, P., Pariset, E.  
*Engineering Journal*, v. 44, no. 6, pp. 62-67, June 1961

Results of experiments and deduced laws of R. Durand are cited. The transport of homogeneous and heterogeneous mixtures is presented with calculations of power necessary for horizontal transport. Pressure furnished by the pumping station should always be greater than that required for a conduit; it is necessary that conduit diam-

eter be equal to or greater than three times that of largest grains. A list of recent industrial applications is given and economic aspects are considered. (EI, 1961)

**1,421. PNEUMATIC MATERIALS HANDLING — SURVEY REPORT**  
Jellinek, J. E.  
*Plastics Technology*, v. 7, no. 6, pp. 47-51, 54, June 1961

By installing a pneumatic conveying system, a plastics processor can take advantage of substantial material price discounts, minimize resin contamination, and reduce labor expenditures. This survey includes cost considerations, equipment and design, types of conveying systems, controls, and economics. (EI, 1961)

**1,422. PNEUMATIC CONVEYING FUNDAMENTALS**  
Molyneux, F.  
*Fluid Handling*, no. 137, pp. 152-154, June 1961; no. 138, pp. 192-194, July 1961

Theoretical considerations are presented and types of systems used are described. Auxiliary equipment required is listed. Expanded use of pipe lines is discussed for conveyance of solids such as pulverized coal, grain and other solids in bulk in suspension in either liquid or gas. Advantages of a tubular two-phase conveyor in chemical industry and in mineral ore industry are given. The suitability of the injector system, and of the separation and recycling of gas or liquid is considered. (EI, 1961)

**1,423. PNEUMATIC CONVEYING SYSTEM SPEEDS ALUMINUM SCRAP COLLECTION**  
Silberberg, W. S., Shoresman, A. M., Abramson, R. J.  
*Heating, Piping, and Air Conditioning*, v. 33, pp. 101-105, June 1961

**1,424. CONVEYING AND STORAGE OF CLAY**  
Stoess, H. A., Jr.  
*Tappi*, v. 44, Supplement, pp. 244A-246A, June 1961

**1,425. HOW DIALS DIRECT PNEUMATIC MESSENGERS**  
Todt, G.  
*Control Engineering*, v. 8, no. 6, pp. 128-130, June 1961

A completely self-supervised pneumatic tube system is described, which was built by Airmatic Systems Corporation, to transport interoffice documents in First National City Bank's new uptown headquarters in New York City. The transmission system speeds up to 2,400 carriers per hr between 65 stations. As many as 175 carriers can move through the system simultaneously with electro-mechanical control circuits assuring that each arrives at its destination in less than 1 min. (EI, 1961)

- 1,426. AUTOMATED CONVEYORS INCREASE PRODUCTIVITY  
*Plant Management and Engineering*, v. 23, pp. 28-30, June 1961

- 1,427. PNEUMATIC REMOVAL  
Marchlewski, A. J.  
*American Machinist/Metalworking Manufacturing*, v. 105, pp. 95-102, July 24, 1961

- 1,428. RASCHET SOPROTIVLENIYA RAZGONNOGO UCHASTKA PRI PNEVMOTRANSPORTE (CALCULATION OF RESISTANCE OF ACCELERATING DISTANCE IN PNEUMATIC TRANSPORT)  
Dogin, M. E., Karpov, A. I.  
*Inzhenerno-Fizicheskii Zhurnal*, v. 4, no. 7, pp. 47-51, July 1961

Calculation formulas are given for resistance of accelerating distance in pneumatic transports. Recommendations are made for transport, by air flow in horizontal pipes, of material in a suspended state. (EI, 1961)

- 1,429. TROUBLE-SHOOTING METAL-MESH BELTS IN GLASS MANUFACTURING  
Hanson, J. B.  
*Glass Industry*, v. 42, no. 7, pp. 385-387, July 1961

Suggestions are made for correcting difficulties with metal mesh belts used for such applications as annealing, decorating, and transfer. Possible causes and corrections refer to erratic belt travel, belt slippage or humping, excessive wear, marking of ware, etc. (EI, 1961)

- 1,430. IMPROVEMENT OF EXISTING PNEUMATIC HANDLING INSTALLATIONS AT MINIMUM COST  
Leko, T.

*Handling, Conveying, Automation — International* (English edition of *Foerdern und Heben*), no. 7, pp 245-246, July 1961

Results of former study show that considerable power reductions are possible by using air pipes of oval cross section instead of circular ones. (EI, 1961)

1,431. INLET GUIDE VANE PERFORMANCE OF CENTRIFUGAL BLOWERS

Stepanoff, A. J.

*ASME, Transactions of the, Series A — Journal of Engineering for Power*, v. 83, no. 3, pp. 371-380 [Paper 60-WA-130], July 1961

The function and effectiveness of inlet guide vanes to control blower output and power requirements are examined. Calculated and experimental results of power reduction by means of guide vanes are given. The concept of "Inlet Specific Speed" widely used in the centrifugal pump field is discussed in application to blowers. A method of estimating performance of single-stage blowers for position of guide vanes is described as well as performance of inlet vanes of multistage blowers. (EI, 1961)

1,432. COMBINATION SHEAVE AND CLUTCH ADDS LIFE TO CONVEYOR MOTORS  
*Mill and Factory*, v. 69, p. 93, July 1961

1,433. PUMPING ABRASIVE SLURRIES AND SLUDGES

*South African Mining and Engineering Journal*, v. 72, no. 3575, p. 331, August 11, 1961

By combining the principles of the well-known torque-flow pump with exceptionally good wear-resisting properties of special nickel cast iron, a British company has produced a pump which will operate reliably for long periods when handling liquids, slurries, or sludges containing highly abrasive solids either in the form of particles or lumps. (EI, 1961)

1,434. IMPROVED CONVEYOR BELT FASTENERS  
*South African Mining and Engineering Journal*, v. 72, no. 3577, p. 443, August 25, 1961

The improved conveyor belt fastener is of conventional plate type. Modifications, although of comparatively simple nature, have successfully eliminated application problems associated with the regular model, and at the same time have brought about speedier fitting, stronger and more highly compressed joints, and reduced scraper problems. (EI, 1961)

1,435. WALKING CONVEYOR STAYS LEVEL

*Product Engineering*, v. 32, p. 29,  
August 28, 1961

1,436. PIPELINES SHOW GOOD POTENTIAL  
FOR LONG-DISTANCE TRANSPORTING  
OF SOLIDS

Costantini, R.

*Mining Engineering*, v. 13, no. 8, pp. 977-981,  
August 1961

Examples are given of existing and planned facilities for transport of slurries by long-distance pipe lines, and the advantages of pipe line over railroads are pointed out. Procedures used in pipe lining industrial minerals and coal, technical factors in pipe line operation and maintenance, influence of particle size, effect of pipe size on velocity, and pumping considerations are covered, (*EI*, 1961)

1,437. ZAVISIMOST SOPROTIVLENIYA  
PNEVMOTRANSORTNYKH TRUBOPRO-  
VODOV OT OSNOVNYKH PARAMETROV  
DVUKHFAZNOGO POTOKA (DEPEND-  
ENCE OF RESISTANCE OF PNEUMATIC  
TRANSPORT PIPES ON BASIC  
PARAMETERS OF TWO-PHASE FLOW)

Dogin, M. E., Lebedev, V. P.

*Inzhenerno-Fizicheskii Zhurnal*, v. 4, no. 8,  
pp. 93-98, August 1961

Dependence of resistance coefficient on weight concentration, specific weight and size of transported particles is discussed. (*EI*, 1961)

1,438. NEW ELECTRICALLY OPERATED  
TRAVELLING ORE UNLOADER FOR  
CARGO FLEET IRON WORKS

*Metallurgia*, v. 64, pp. 76-78, August 1961

1,439. HANDLING AND BALING SCRAP FROM  
MULTIPLE PRESS LINES

Meyfarth, G. H.

*Automation*, v. 8, no. 8, pp. 72-76, August 1961

This scrap collecting and baling installation at Cleveland Stamping Plant of Ford Motor Co. is an integrated system that includes 22 constant speed feeder conveyors, four adjustable speed main conveyors, and two baler conveyors, and is used to move 680 tons per day of trim scrap

from presses to balers. The system includes interlocks and safety devices and incorporates controls for special operating conditions. (*EI*, 1961)

1,440. CONVEYOR BELT HORSEPOWER AND  
OPERATING DISTANCES CONTINUE  
TO INCREASE

Traxler, E. R.

*Engineering and Mining Journal*, v. 162, no. 8,  
pp. 86-87, August 1961

Listings are given of the world's largest belt conveyor installations. Sixteen are listed on the basis of length and 41 on the basis of horsepower. Data on belt carcass material, loading rates and belt speeds, terminal pulley centers, belt width, and conveyor belt drives are presented. (*EI*, 1961)

1,441. BELT CONVEYORS REPLACE TRUCKS  
FOR LONG, STEEP HAULS

Utley, H. F.

*Pit and Quarry*, v. 54, pp. 86-89, August 1961

1,442. 5½ MILE BELT CONVEYOR  
INSTALLATION

*Mine and Quarry Engineering*, v. 27, no. 8,  
pp. 374-376, August 1961

A haulage system adopted to convey 1,000 tph 5½ mi from the quarry to the cement plant at Lawrence, Okla., consists of seven endless rubber conveyor belts. With the belt width of 3 ft operating at 500 ft/min, the conveyor belt will handle either ¾-in. crushed limestone or 6-in. shale, the belts being carried throughout on some 8500 Link-Belt idlers. The control of progressive stopping of belts to prevent piling up of material, should runaway speed be reached, is by electromagnetic braking fitted on tail pulleys. (*EI*, 1961)

1,443. PNEUMATIC CONVEYOR NOW  
HANDLES POWDERS

*Chemical and Engineering News*, v. 39, p. 134,  
September 4, 1961

1,444. IMPROVEMENTS IN AND RELATING TO  
PIPES FOR CONVEYING LIQUIDS  
AT HIGH TEMPERATURE

Huet, A.

September 6, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 876,658

A piping system for fluids at a temperature of the order of 600°C or above is described. The system consists of two metallic, coaxial tubes spaced apart; the inner tube is provided externally with radially extending members. The extremities of these radially extending members are spaced from the inner wall of the outer tube by a distance dependent on the degree of expansion of the inner tube and the working temperature of the members. Heat insulation material is disposed between the two tubes. The radially extending members may consist of disks spaced apart on the inner tube or extremities formed integrally with the inner tube. The system may involve an outer tube which is made up of rings spaced longitudinally of the system and joined together by sleeves. Each ring is turned radially inward at the edge to form an annulus which is cooperable with one of the inner-tube extremities. (NSA, 1961)

- 1,445. SCREW FEEDER RAISES ORE YIELD  
*Iron Age*, v. 188, p. 186, September 14, 1961

- 1,446. CONVEYORIZED GRINDING HOLDS CLOSE HONEYCOMB TOLERANCES  
Brown, L. G.  
*Space/Aeronautics*, v. 36, pp. 81, 83, 85  
September 1961

- 1,447. TRANSFERRING METHODS  
Irish, M. C.  
*Automation*, v. 8, no. 9, pp. 69-74,  
September 1961

Mechanisms devised to accomplish transfer function are described. A discussion is presented concerning how these systems work, and under what conditions each is best applied. This survey includes swinging finger mechanisms, a standard power package, a lift-and-carry unit, overhead mounted devices, a parallelogram transfer method, latch finger bars, and sprocket and chain systems. Positioning accuracy and other capabilities are considered. (EI, 1961)

- 1,448. CONVEYOR BRIDGES IN COMPOSITE CONSTRUCTION  
Koeppel, W.  
*Handling, Conveying, Automation — International* (English edition of *Foerdern und Heben*), no. 9, pp. 341-344, September 1961

Sample calculations show how DIN German Standard Regulations on construction of compound girder road bridges can be applied to conveyor bridges in composite

construction. The latter is used successfully only where conveyor bridges are designed in the form of deck bridges. (EI, 1961)

- 1,449. LET'S TAKE A SHARP LOOK AT BELT CONVEYOR DESIGN  
Meschter, E.  
*Rock Products*, v. 64, pp. 113-114, 116, 118, 120, September 1961
- 1,450. IMPROVEMENTS IN CONVEYOR BELTING IN THE UNITED KINGDOM  
Weinberg, S.  
*Mining Congress Journal*, v. 47, pp. 40-44, September 1961; pp. 83-87, October 1961
- 1,451. 12 KM LONG CONVEYOR FOR IRON ORE IN SOUTH AMERICA  
Yu, A. T.  
*Handling, Conveying, Automation — International* (English edition of *Foerdern und Heben*), no. 9, pp. 348-350, September 1961
- The conveyor belt system operating in Atacama desert of Northern Chile handles 400 to 500 tph at 2.8 m/sec. The entire run is divided into 13 conveyor sections of 61-cm belt width, the longest section being 1.2 km with the discharge point located 229 m below the feed end. Details on belt fabric and electric drive system are given. (EI, 1961)
- 1,452. IRON ORE DRESSING PLANT USING BELT CONVEYORS FOR HEAVY MATERIAL  
Blanc, E. C.  
*Handling, Conveying, Automation — International* (English edition of *Foerdern und Heben*) no. 10, pp. 358-363, October 1961
- A detailed description is given of the ore handling system at the dressing plant of Senelle works in Longwy, France. Crushing, screening, storing, sintering and reclaiming facilities are grouped in a 700-m line. The average handling capacity is 1000 tph and 1500 tph at the peak. The entire plant is fully automated and controlled by a staff of three. (EI, 1961)
- 1,453. PITFALLS IN AIR CONVEYING  
Burrell, D. L.  
*Modern Materials Handling*, v. 16, pp. 95-97, October 1961

- 1,454. LES TRANSPORTS PNEUMATIQUES DANS LES ACIERIES (PNEUMATIC TUBES IN STEELWORKS)  
Gouyou-Beauchamps, J.  
*Revue de Métallurgie*, v. 58, no. 10, pp. 849-856, October 1961

A description is given of use of pneumatic tubes for transferring specimens, analysis sheets, and production schedules. Relative advantages of suction and compressed air methods are discussed as well as different dispatching, receiving, and routing devices. Examples of systems used in different plants are presented. (*EI*, 1961)

- 1,455. GURTFOERDERER FUER MASSENGUT-TRANSPORTE (BELT CONVEYORS FOR HANDLING OF BULK MATERIALS)  
Mohrs, E.  
*Zement-Kalk-Gips*, v. 14, no. 10, pp. 429-440, October 1961

Various types of belts of steel, fabric, plastics, and rubber are evaluated. Examples show the superiority of rubber belts for conveyors for vertical transportation, and for bucket elevators. (*EI*, 1961)

- 1,456. BELT CONVEYOR SYSTEM MASTERS TERRAIN AND CLIMATE TO BUILD A GIANT DAM IN THE HIGH ALPS  
vonHillebrandt, F.  
*Rock Products*, v. 64, pp. 116, 119, October 1961

- 1,457. CONTINUOUS CONVEYORIZED LOOP PROCESSING; A NEW CONCEPT IN ROD AND WIRE HANDLING  
Zouck, J.  
*Wire and Wire Products*, v. 36, no. 10, pp. 1333-1335, 1452-1456, October 1961

- 1,458. BREWSTER BELTS ROCK TWO MILES IN UNIQUE FREEWAY GRADING OPERATION  
*Roads and Streets*, v. 104, pp. 50-52, 82, 86-88, October 1961

- 1,459. VIBRATOR VARIES CONVEYOR SPEED  
*Iron Age*, v. 188, p. 117, November 16, 1961

- 1,460. SHUTTLE MINECAR  
*The Engineer*, v. 212, p. 835, November 17, 1961

- 1,461. HOW TO KEEP YOUR CONVEYORS ROLLING ALL WINTER  
Elwood, J. F.  
*Rock Products*, v. 64, pp. 92, 117, November 1961

- 1,462. BELT CONVEYORS SPEED PLACER MINING  
Schmidt, H. H.  
*Engineering and Mining Journal*, v. 162, pp. 104-105, November 1961

- 1,463. OVERHEAD CONVEYOR FEEDS PARTS TO MOTOR ASSEMBLY  
*Automation*, v. 8, p. 63, November 1961

- 1,464. FLUID-SOLIDS HANDLING SURVEYED BY HYDRAULIC INSTITUTE  
*Power*, v. 105, p. 79, November 1961

- 1,465. IT AUTOMATICALLY LUBRICATES OVERHEAD CHAIN CONVEYORS  
*Industrial Finishing*, v. 38, pp. 117-118, December 1961

- 1,466. NATURAL FREQUENCY VIBRATORY CONVEYING  
*Plant Management and Engineering*, v. 23, p. 55, December 1961

- 1,467. HYDRAULIC CONVEYING OF SOLIDS IN VERTICAL PIPES  
Newitt, D. M., Richardson, J. F., Gliddon, B. J.  
*Institution of Chemical Engineers, Transactions of the*, v. 39, no. 2, pp. 93-100, 1961

In case of vertical transport, conveying will always occur provided liquid velocity exceeds settling velocity of particles. The experimental plant used consisted of pump, tank, piping, and valves. Graphs relate concentration, hydraulic gradient and velocity for slurries of sand, pebbles, zircon, manganese dioxide, and Perspex. (*EI*, 1961)

- 1,468. INCREASED PRODUCTIVITY FROM SLOWER CONVEYOR  
*Engineering*, v. 193, p. 149, January 26, 1962

- 1,469. PNEUMATIC CONVEYING OF GRANULAR PLASTICS  
Fischer, J.  
*Chemical Engineering Progress*, v. 58,  
pp. 66-69, January 1962
- 1,470. GERMAN ENGINEERS DEVELOP CONVEYORS THAT TWIST [ABSTRACTS]  
Klinkenborg, G. L.  
*Mining Engineering*, v. 14, pp. 46-47,  
January 1962; *Iron Age*, v. 189, pp. 98-99,  
March 1, 1962
- 1,471. MAGNETS INDICATE CARRIER ORIENTATION, ROUTING  
Morrison, J.  
*Control Engineering*, v. 9, p. 103, January 1962
- 1,472. THREE EFFECTIVE SYSTEMS FOR DISPATCHING  
*Modern Materials Handling*, v. 17, pp. 74-75,  
January 1962
- 1,473. TUBULAR CONVEYOR UPS EFFICIENCY FOR WEST COAST HARDWARE MANUFACTURER  
*Plant Management and Engineering*, v. 24,  
pp. 33-34, January 1962
- 1,474. SPECIAL CONVEYOR RIG FOR FASTER COLUMN POURS  
*Roads and Streets*, v. 105, pp. 108-109,  
January 1962
- 1,475. AIR-SURFACED PULLEY  
*Machine Design*, v. 34, p. 163, February 15, 1962
- 1,476. DEEP-TROUGUED TERYLENE CONVEYOR  
*Engineering*, v. 193, p. 243, February 16, 1962
- 1,477. LINKING STANDARD MACHINES  
*Engineering*, v. 193, p. 285, February 23, 1962  
Conveyors are considered.
- 1,478. RECIPROCATING ROLLER CONVEYOR CONTROLS UNIT FLOW  
Bowen, M. S., Fleischauer, F. J.  
*Automation*, v. 9, pp. 90-92, February 1962

- 1,479. TAPE TRANSPORT TRANSPORTS SAMPLE AS WELL  
Ronchetto, J. J., Jr.  
*Control Engineering*, v. 9, no. 2, p. 139,  
February 1962

Certain experiments at the Lawrence Radiation Laboratory required a rapid, low-inertia transport system that would move a lightweight (50 mg) uranium foil into a high neutron flux, irradiate it for a preset time, remove it from the flux, permit it to decay for a preset time, and then record its beta spectrum on a 256-channel pulse height analyzer for another preset time. In addition, the cycle had to be repeated after still another time interval. At first a pneumatic system was considered, but the mechanism decided on was a closed tape loop that not only transports the sample but also governs irradiation and measuring.

- 1,480. TENSIONS IN STRAIGHT AND CURVILINEAR BELT CONVEYERS  
Winkler, W. A.  
*ASME, Transactions of the, Series B — Journal of Engineering for Industry*, v. 84, pp. 191-196,  
February 1962
- 1,481. STEEL BELT CONVEYORS, THEIR ADVANTAGES INCREASE APPLICATION IN METAL PARTS HANDLING  
*Plant Management and Engineering*, v. 24,  
pp. 22-25, February 1962
- 1,482. BULK RESIN HANDLING;  
PNEUMATIC CONVEYORS  
*Plastics World*, v. 20, p. 40, February 1962
- 1,483. CONVEYOR BELT CAN DO THE TWIST  
*Engineering News-Record*, v. 168, pp. 43-44,  
March 8, 1962
- 1,484. CONVEYOR PACES STEEL FOUNDRY  
*Iron Age*, v. 189, pp. 76-77, March 8, 1962
- 1,485. OVERHEAD CONVEYOR  
*The Engineer*, v. 213, p. 501, March 16, 1962
- 1,486. COIL CONVEYOR QUICKENS ALUMINUM MILL WORK CYCLE  
*Steel*, v. 150, p. 168, March 26, 1962

- 1,487. UNIT VACUUM SYSTEM SOLVES CHIP DISPOSAL PROBLEM  
Carr, D. J.  
*Plant Engineering*, v. 16, pp. 139-140, March 1962
- 1,488. LATEST GUIDE TO PROPER GRADES FOR GRAVITY CONVEYORS  
Linden, M.  
*Modern Materials Handling*, v. 17, pp. 80-81, March 1962
- 1,489. PRINCIPLES OF CONVEYOR DISPATCHING  
Vander Meer, C.  
*Automation*, v. 9, pp. 81-85, March 1962
- 1,490. PVC TRAY COATING; CONVEYOR TRAYS AT LOS ANGELES' NEW INTERNATIONAL AIRPORT  
*Plastics World*, v. 20, p. 60, March 1962
- 1,491. CONVEYOR BELT TILTS TO DUMP [ILLUSTRATIONS WITH TEXT]  
*Product Engineering*, v. 33, p. 66, April 30, 1962
- 1,492. PNEUMATIC CONVEYING SYSTEM HANDLES BREWERY MATERIALS  
*Automation*, v. 9, pp. 88-90, April 1962
- 1,493. CONVEYOR DRIVE SYSTEM  
*Iron and Steel Engineer*, v. 39, pp. 258-259, April 1962
- 1,494. 1962 MATERIALS HANDLING AND PACKAGING DIRECTORY; CONVEYING EQUIPMENT  
*Modern Materials Handling*, v. 17, pp. 207-248, May 1962
- 1,495. OFF-THE-SHELL CHIP CONVEYORS  
Meyfarth, G. H.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 64-65, June 25, 1962

## CUTTING MECHANISMS AND EQUIPMENT

### 1,496. REMOTE SHEARING

Abbiatiello, A. A.

November 14, 1958

Oak Ridge National Laboratory, Tenn.

CF-58-11-57

(Also available through U.S. Dept. of Commerce,  
Office of Technical Services, Washington, D.C.)

A hydraulic shearing tool was developed for application to remote severing of pipes or structural members. The tool is positioned or rotated about its axis by hydraulic operators utilizing the shear hydraulic power unit. It was designed for a C-type suspension from a building crane to provide an offset for operation through an opening in the ceiling of a shielded cell. The shear has been proven for cutting metal sections up to 4-in. schedule-40 stainless steel pipe. (NSA, 1960, #13,809)

### 1,497. THE DESIGN AND OPERATION OF A COMBINATION WET CUTOFF WHEEL AND MILLING MACHINE

Lusk, E. C., Burian, R. F.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 214-218

American Society of Mechanical Engineers,  
New York, N. Y.

In preparing irradiated specimens for examination, a number of cutting operations are required. Ideally these operations can best be performed by an abrasive cutoff wheel; however, the use of such a device in a hot cell normally involves special problems in operation and decontamination. Battelle has designed a combination abrasive cutoff wheel and milling cutter which provides satisfactory performance with a minimum of decontamination problems. This equipment is basically a modified standard Clausing vertical milling machine. The listed costs and performances attest to the versatility and economy of the unit. (NSA, 1959, #17,611)

### 1,498. WET CUT-OFF SAW FOR REMOTE USE

Stearns, R. F.

In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 247-251

American Society of Mechanical Engineers,  
New York, N. Y.

The Irradiations Laboratory was requested to design a wet cutoff saw for use on larger samples. The maximum size was specified as  $14 \times 2\frac{3}{4} \times \frac{1}{4}$  in. A set of specifications was written to define the over-all requirements. One of the two main requirements was the ability to make accurately located cuts having a smooth surface. The other main requirement was to keep the cutting temperature below the level at which metallurgical change would take place. A study was made of all existing designs. Discussions were also held with people who have operated this type of equipment in order to become familiar with the state of the art. The finished design incorporated the main requirements plus simplicity, low cost, and light weight. Features were included that should facilitate remote decontamination. (NSA, 1959, #17,616)

### 1,499. DEVICE FOR REMOTELY SLITTING ALUMINUM TUBES

Chismar, P. H.

In "Supplement to the Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," American Society of Mechanical Engineers, New York, N. Y.

The design is given for a device which removes distorted, irradiated slugs from aluminum tubes for examination. It has been successfully tested in a "hot" cell. (NSA, 1959, #22,350)

### 1,500. IMPROVEMENTS IN OR RELATING TO APPARATUS FOR HANDLING NUCLEAR REACTOR FUEL ELEMENTS

Challender, R. S., Knights, H. C.

June 17, 1959

U.S. Department of Commerce, Washington, D.C.  
British Patent 814,996 (assigned to United Kingdom Atomic Energy Authority)

A machine for removing the sheaths from clad fuel elements is described. A circular die is forced between clad and fuel. Special provision is made for aligning the fuel element with the die and for preventing bowing of the fuel element when the initial cut through the end cap is made. (NSA, 1959, #18,079)

1,501. UNDERWATER ELECTRIC ARC  
CUTTING MANIPULATOR FOR  
HRT SCREEN REMOVAL

Holz, P. P.

November 26, 1959

Oak Ridge National Laboratory, Tenn.

CF-59-11-130

A manipulator system incorporating a simplified heli-arc underwater cutting torch was designed, developed, and tested to perform the following remote functions: enter through the existing 2-in. HRT core access opening; pick up and transfer screens from the horizontal to a vertical position; latch and firmly clamp a screen against the manipulator mast; move a torch to permit the cutting of screen strips of predetermined width; and provide electrical signals to determine effectiveness of cutting. Detailed descriptions of equipment and manipulator operating specifications and procedures are included. (NSA, 1961, #8920)

1,502. DUAL DIAPHRAGM SIMPLIFIES FUEL  
SYSTEM: ALLOWS HOLDING CHAIN  
SAW AT ANY ANGLE

*Product Engineering*, v. 31, p. 50,  
January 18, 1960

1,503. DYNAMOMETER TESTS ON CUTTING  
ACTION OF CHAIN-SAW TEETH

Oehrli, J. W.

*Forest Products Journal*, v. 10, no. 1, pp. 4-7,  
January 1960

Research with various chain-saw teeth mounted on a disk driven by a dynamometer is reported. Accurate data are given on cutter performance under controlled conditioning. A procedure has been established for rating the machinability of wood, enabling the rating of cutting efficiency for various cutters. Improvements are suggested in chain-saw performance to reduce wear, increase edge life, and reduce power requirements of tools. (EI, 1960)

1,504. EFFECTS OF CLEARANCE AND RAKE  
ANGLES ON TOOL LIFE

Bodart, E., Andri, G.

*Microtecnica*, v. 14, no. 1, pp. 30-33,  
February 1960

An experimental study of effects of tool behavior has been undertaken. Considerations of tool geometry in-

clude definitions of true rake angle, side clearance angle, back rake angle, side cutting angle, nose angle, side top rake, front top rake angle, side clearance, and nose clearance angle. Three graphs were derived which relate cutting speed corresponding to one-hour tool life to clearance angle, wedge angle, and back rake angle. Sketches and mathematical analyses are included. (EI, 1960)

1,505. BAND-SAWING TITANIUM AND  
TITANIUM ALLOYS

Olofson, C. T.

*Light Metal Age*, v. 18, no. 1-2, pp. 18, 20-22, 30,  
February 1960

Cutting environment is considered. Information on saw bands includes: tool materials, types, design, and pitch. Operating recommendations are made. (EI, 1960)

1,506. GETTING MORE OUT OF YOUR  
CUTTING TOOLS AND HOLDERS

Conn, H.

*Carbide Engineering*, v. 12, no. 3, pp. 11-15,  
March 1960

(See also *Machine and Tool Blue Book*, v. 55,  
no. 3, pp. 115, 117-120, March 1960)

The importance of knowing interrelation of tangential, radial, and longitudinal forces at work on cutting tools for improving quality and increasing cutting tool life is discussed. The effect of these forces upon deflection is described, and the method of computing and minimizing deflection is included. (EI, 1960)

1,507. SUBMERGED-ARC WELDED LAND  
CLEARING BLADE USES T-1 STEEL

Cunningham, R.

*Welding Engineer*, v. 45, pp. 46-47, April 1960

1,508. OPYT PRIMENENIYA ANODNO-  
MEKHANICHESKOI RAZREZKI  
(IMPROVED DESIGN OF ANODO-  
MECHANICAL SAWING MACHINE)

Kurchenko, V. I.

*Stanki i Instrument*, v. 31, no. 8, pp. 35-37,  
August 1960

(See also English translation in *Machines and Tooling*, v. 31, no. 8, pp. 39-40, 1960; English abstract in *Engineers' Digest*, v. 21, no. 11, pp. 90-91, November 1960)

Disk jamming, inclination of cut, metal overflow toward end of cut, and other disadvantages are eliminated. The production rate of the machine is 2.5-4 times greater than that of conventional machines for electro-mechanical sawing. Features of the machine are described. (*EI*, 1961)

- 1,509. FAST, ACCURATE CIRCULAR SAW CUTS NONFERROUS METALS  
*Iron Age*, v. 186, no. 10, pp. 95-97,  
September 8, 1960

In cutting nonferrous metals, cutting speed and surface finish are paramount production factors. A new high speed circular saw cuts either thin-walled extrusions or solid sections up to 8 in. thick; 8-in.-D Al ingots can be cut in 1 min with surface finish between 30 and 40  $\mu\text{in}$ . The saw manufactured by DeWalt, Inc., depends on hydraulically controlled power cross feed, a mist coolant system, and a tungsten carbide tipped blade for its successful operation. Performance is described for a variety of materials. (*EI*, 1960)

- 1,510. SHEAR OUTPUT TRIPLED BY SHEET-HANDLING SYSTEM  
*American Machinist/Metalworking Manufacturing*, v. 104, pp. 120-122,  
November 14, 1960

- 1,511. SHIELDED ARC WELDING AND FLAME CUTTING EQUIPMENTS  
*The Engineer*, v. 210, p. 847, November 18, 1960

- 1,512. HOT TUBE NYLON CORD CUTTER FOR BALLOON FLIGHTS  
Phillips, J. A., Wills, H. H.  
*Journal of Scientific Instruments*,  
v. 37, pp. 440-441, November 1960

- 1,513. NIAGARA REDESIGNED LINE OF CIRCLE, RING, AND SLITTING SHEARS  
*Machinery*, v. 67, p. 180, December 1960

- 1,514. METAL-CUTTING BIBLIOGRAPHY, 1943-1956  
American Society of Tool and Manufacturing Engineers, Detroit, Mich., 1960

Five thousand, five hundred and ninety-three brief abstracts of metal-cutting literature are presented. They

include general machining; turning; boring and trepanning; drilling and reaming; broaching; milling and hobbing; planing and shaping; tapping and threading; gear cutting; sawing; filing; grinding; honing, lapping and superfinishing; ultrasonic machining; and electro-erosion. (*EI*, 1961)

- 1,515. MAGNETIC PICKOFF READS RACK PROGRESS WITHOUT PHYSICAL CONTACT ON AN INDUSTRIAL SHEARING INSTALLATION  
*Machine Design*, v. 33, p. 141, January 5, 1961

- 1,516. NOWE TYPE OBRABIAREK SKRAWAJACYCH DO METALI (NEW TYPES OF METAL CUTTING MACHINE TOOLS)  
Kaniewski, A.  
*Przeglad Mechaniczny*, v. 20, no. 1, pp. 15-22,  
January 10, 1961

An outline of the Polish machine tool industry is presented including types of manufactured lathes, automatic lathes, drills, milling machines, and grinding machines. (*EI*, 1961)

- 1,517. HOW TO CUT BANDSAWING COSTS  
Cleland, C.  
*American Machinist/Metalworking Manufacturing*, v. 105, no. 4, pp. 94-96,  
February 20, 1961

A most economical bandsaw cutting rate can be achieved by finding top speed at which accuracy can be maintained. A method for determining maximum usable cutting rate is described. (*EI*, 1961)

- 1,518. CUTTERS, BENDERS PREPARE PARTS LEADS QUICKLY  
*Electronics*, v. 34, pp. 70-73, March 3, 1961

- 1,519. THIRD-RAIL SAW: TRI-RAIL PANEL SAW  
*Plastics World*, v. 19, p. 23, March 1961

- 1,520. SAWING OF WOOD  
Endersby, H. J.  
*Research*, v. 14, pp. 126-130, April 1961

1,521. CHERVYACHNYE FREZY S  
IZMENENNOI GEOMETRIEI  
(HOBBS WITH CHANGED CUTTING  
EDGE GEOMETRY)

Inozemtsev, G. G.

*Stanki i Instrument*, v. 32, no. 4, pp. 20-23,  
April 1961

(See also English translation in *Machines and  
Tooling*, v. 32, no. 4, pp. 22-25, 1961)

Five hobs of varied geometry and design were tested. Radial rake was found to have an important effect on cutting force; positive radial rake considerably reduces cutting forces. Test results are given and wear of hobs is considered. (*EI*, 1961)

1,522. TO MILWAUKEE-MATIC CONSTANT  
CUTTING IS VITAL

Joyce, D. H.

*Cutting Tool Engineering*, v. 13, no. 4, pp. 12-15,  
April 1961

A tape-controlled machine tool automatically changes cutting tools and indexes the table to present more than one side of the workpiece to the cutting element. One of the major reasons for the efficiency of the machine is that the cutting edge is at work almost constantly, there being practically no idle spindle time, once the machine is set up and the job is in process. The setup of the machine is described. The article includes information on the automatic tool changer, toolholders, pre-set tooling, and tool life and maintenance. (*EI*, 1961)

1,523. INFLUENCE OF CUTTING EDGE  
SHARPNESS ON TOOL BEHAVIOR

Simonet, J.

*Microtecnica*, v. 15, no. 2, pp. 44-46, April 1961

1,524. EINMANN-MOTORSAEGE "CONTRA"  
(ONE-MAN MOTOR SAW "CONTRA")

*Motortechnische Zeitschrift*, v. 22, no. 4,  
pp. 131-133, April 1961

A one-man motor saw, "Contra", built by Andreas Stihl, Waiblingen-Neustadt, Wurttemberg, Germany, is powered by a two-stroke engine of 106 cm<sup>3</sup> at 6 hp and 6500 rpm. Engine specifications and constructional details are given. (*EI*, 1961)

1,525. GIANT SAW CUTS GIANT SCRAP

Epstein, I.

*American Machinist/Metalworking  
Manufacturing*, v. 105, no. 11, pp. 70-71,  
May 29, 1961

Because of the high cost of flame cutting huge (14 to 30 ton) manganese bronze ship propellers, a saw was built by the Panama Machinery Co., Seattle, Wash., that would span 55 in. in one cut. Considered in the article are the construction of the saw, feeding of work, making cuts, and slitting the hub. (*EI*, 1961)

1,526. GERAESCHUNTERSUCHUNGEN AN  
KREISSAEGEMASCHINEN (NOISE  
STUDIES ON CIRCULAR SAWS)

Pahlitzsch, G., Meins, W.

*Werkstatttechnik*, v. 51, no. 5, pp. 250-254,  
May 1961

Noise as the result of blade oscillations, increase of noise with an increasing number of revolutions, diameter, width, and number of the teeth of the blade, and reduction of noise are considered. (*EI*, 1961)

1,527. KIERUNKI ROZWOJU OBRABIAREK  
DO OBROBKI METALI W POLSCE W  
LATACH 1961-1965 (DEVELOPMENT  
TRENDS OF POLISH METAL CUTTING  
TOOLS DURING PERIOD BETWEEN  
1961 AND 1965)

Pawlakowski, J., Konopacki, J.

*Mechanik*, v. 34, no. 5, pp. 210-223, May 1961

Information on machine tools for metal and wood planned for production during the period 1961-1962 is tabulated. (*EI*, 1961)

1,528. ELEKTROPRIVOD LETUCHIKH  
NOZHNIKS NEPRERYVNYKH  
ZAGOTOVOCHNYKH STANOV  
(ELECTRIC DRIVE FOR SHEARS  
IN CONTINUOUS MILLS)

Pistrak, M. Ya., Shagas, L. Ya.

*Elektricheskvo*, v. 81, no. 5, pp. 31-38, May 1961

Synchronization of shears and stands, and the cutting of uniform lengths are given consideration. The advantages of the system used in the USSR, in which planetary and eccentric shears are used along with a special mechanism for missing cuts, are described. (*EI*, 1961)

1,529. TRACER MACHINE CONTOURS  
TO MILLIONTHS

Heslen, R.

*Tool and Manufacturing Engineer*,  
v. 46, no. 6, pp. 101-102, May 1961

A Frauenthal contouring machine holds the thickness of "error envelope" to 0.000300 in. for contoured workpieces and to 0.000100 in. for plane-workpieces; errors in the Minneapolis-Honeywell electrohydraulic tracer system measure only 0.000020 in. in a typical plot. The system operates on 0.010-in. nominal stylus deflection. Three metal removal methods used are single point tools for turning and boring, a belt driven grinding head using diamond wheels for abrasive metal removal, and Vonnegutt brush for fine finishes. (*EI*, 1961)

1,530. SHAVER SKINS ROD QUICKLY

*Iron Age*, v. 187, p. 113, June 15, 1961

1,531. RX FOR BORING-RIGIDITY

Sweeny, A. N.

*Cutting Tool Engineering*, v. 13, no. 7,  
pp. 8-11, July 1961

Rigidity is one of the vital factors to consider when selecting tooling. Length-to-diameter ratios, their effect on boring bars, and materials for boring bar construction are considered as well as methods for handling long reach multiple-wall boring operations. (*EI*, 1961)

1,532. AIR-POWERED CUTTER

*Compressed Air Magazine*, v. 66, p. 11,  
July 1961

1,533. KRAEFT IN SCHEREN (FORCES  
IN SHEARS)

Crasemann, H. J.

*Werkstatttechnik*, v. 51, no. 8, pp. 396-403,  
August 1961

The cutting process and cutting forces are discussed. The main cutting force is calculated, and measurement results and calculation diagrams are given. Mutually influencing variables concerning main cutting forces, which should be known in order to set up a calculation diagram, are considered. (*EI*, 1961)

1,534. ON ECONOMICS OF CUTTING-OFF  
METALS

Remmerswaal, J. L., Matthijzen, M. J. C.  
*Microtecnic*, v. 15, no. 4, pp. 140-150,  
August 1961

Hack, band, and circular sawing is discussed. The production capacity and cost of each method are considered, and automatic and nonautomatic machines compared. (*EI*, 1961)

1,535. DAS KALTFORMEN VERGUETETER  
WERKZEUGSCHNEIDEN (COLD  
DEFORMATION OF HARDENED  
CUTTING EDGES)

Stendorf, S.

*Verein Deutscher Ingenieure Zeitschrift*, v. 103,  
no. 25, pp. 123-141, September 1, 1961

An investigation is reported of the mechanism and factors determining the success of a cold forming operation, by which hardened teeth of woodcutting saws are shaped so that the teeth are sufficiently free cutting without being set and service life is prolonged by the resulting cold hardening. The factors investigated include steel composition, a technique of operation called "sliding upsetting," and the effect of lubrication. (*EI*, 1961)

1,536. REMOVAL OF DAMAGED SM-1  
CONTROL ROD BASKET

Bouldin, J. C.

September 15, 1961

Army Engineer Reactors Group, Fort Belvoir, Va.  
OSB-16  
AD-265,583

During rearrangement of the elements in the SM-1 core, a control rod basket was damaged so severely that it had to be replaced. The damaged basket assembly was left in the inner shield tank while a safe and practical method of removal could be devised. Several possible solutions to the problem were considered. The method finally selected involved cutting the basket underwater by means of a remote cutter and removing the separate pieces through the fuel transfer chute. This method proved to be effective and the damaged basket was successfully removed without undue difficulty. The basket sections were loaded into a spent fuel cask and shipped to ORNL on May 8, 1961. (NSA, 1962, #18,665)

1,537. MACHINE TOOL VIBRATION RESEARCH

Tobias, S. A.

*International Journal of Machine Tool Design  
and Research*, v. 1, no. 1-2, pp. 1-14,  
September 1961

A research program of the Department of Mechanical Engineering, University of Birmingham, England, is reported. Discussion of the dynamics of metal cutting includes cutting with oscillating tools, dynamic stability of machine tools, and the dynamic design of such tools. (*EI*, 1961)

1,538. NEW LOOK AT TOOL ANGLES

McGee, F. J., Slay, G. S.

*American Machinist/Metalworking Manufacturing*, v. 105, no. 20, pp. 95-110, October 2, 1961

Thorough analysis of cutting tool angles and a technique for finding optimum cutting tool geometry for any job, in any material, are presented. (*EI*, 1961)

1,539. RESEARCH FOR IMPROVED CUTTING TOOLS

Taylor, J., Jackson, J. S.

*Engineering*, v. 192, no. 4982, pp. 490-491, October 13, 1961

1,540. DIE VERSPROEDUNG DER KANTEN BEIM SCHERENSCHNITT VON GROB-BLECHEN AUS THOMAS- UND SIEMENS-MARTIN-STAHL (EMBRITTLEMENT OF EDGES DURING SHEARING OF BASIC BESSEMER AND OPEN HEARTH STEEL PLATE)

Naumann, F. K.

*Stahl und Eisen*, v. 81, no. 21, pp. 1404-1409, October 12, 1961; no. 22, pp. 1464-1472, October 26, 1961

Plant tests on a 12- to 24-mm plate cut with circular or guillotine shears are described. Work hardening, impact values, and the effect of the cutting temperature and the post heat treatment are discussed. (October 12, 1961)

Laboratory shearing and stamping tests are detailed. Factors affecting the required cutting force and the impact toughness of edges are considered. (October 26, 1961) (*EI*, 1961)

1,541. PRODUCTION FLAME-CUTTING BY ELECTRONIC CONTROL

*Railway Gazette*, v. 115, no. 16, pp. 450-453, October 20, 1961

1,542. LEVELER, CUT-TO-LENGTH HANDLES 60-IN. COILS  
*Steel*, v. 149, p. 155, October 16, 1961

1,543. VIBRATIONS SHAPE SOVIET TOOLS  
*Iron Age*, v. 188, p. 145, October 19, 1961

1,544. PRECISION HOLE BORING WITH PORTABLE TOOLS  
Mase, R.  
*Tool and Manufacturing Engineer*, v. 47, no 4, pp. 105-106, October 1961

1,545. HORIZONTAL JIG BORING MACHINE  
*The Engineer*, v. 212, pp. 760-761, November 3, 1961

1,546. NEW COATING PROCESS BUILDS STURDIER CUTTING TOOLS: ELECTRO-PHORETIC DEPOSITION  
*Iron Age*, v. 188, pp. 82-84, November 23, 1961

1,547. PLASMA CUTTING TORCHES  
Berg, R. E.

*American Machinist/Metalworking Manufacturing*, v. 105, pp. 93-96, November 27, 1961

1,548. PROPERTIES OF TUNGSTEN CARBIDE-COBALT ALLOYS USED FOR MINERAL CUTTING TOOLS  
Latin, A.  
*Metallurgia*, v. 64, pp. 211-216, November 1961; pp. 267-273, December 1961

1,549. SPARK MACHINING FUNDAMENTALS AND TECHNIQUES  
Smith, G. V.  
*British Institution of Radio Engineers, Journal of the*, v. 22, pp. 409-417, November 1961

1,550. CAMS MAKE BILLET CUTTER OPERATION SAFE  
Steel, A. M.  
*Hydraulics and Pneumatics*, v. 14, pp. 92-93, November 1961

1,551. PROGRAMMED BILLET CUTTING  
*Automation*, v. 8, p. 47, November 1961

- 1,552. ADJUSTABLE MICROBORE CARBIDE CUTTING-TOOL CARTRIDGE UNITS  
*Machinery*, v. 68, p. 138, November 1961
- 1,553. ELECTRONIC-HYDRAULIC DIE CUTTER CHALLENGES CONVENTIONAL CLICKERS  
*Rubber World*, v. 145, pp. 84-85, November 1961
- 1,554. INDEXING, DRILLING BY AIR SPEED HANDLE OUTPUT  
*Steel*, v. 149, p. 93, December 4, 1961
- 1,555. FABRICATION SPEEDED WITH NEW OXY-FLAME CUTTER  
*Engineering*, v. 192, p. 749, December 8, 1961
- 1,556. NATCO HYDRAULIC FEED DRILLING MACHINES COMPENSATE FOR FLUID TEMPERATURE CHANGES  
*American Machinist/Metalworking Manufacturing*, v. 105, p. 40, December 11, 1961
- 1,557. REMOTELY CONTROLLED SHEARING OF PIPE AND STRUCTURAL MEMBERS  
Abbiatiello, A. A.  
December 28, 1961  
Oak Ridge National Laboratory, Tenn.  
ORNL-3184, W-7405-eng-26
- A shearing tool was developed for remotely controlled severing of pipes or structural members. The shear is rotated about its axis in a wrist motion by the pumped hydraulic fluid that also powers the shear blade. It can be used in a stationary mounting or suspended from a crane. A C-shaped support for the shear was designed to pass through a small top opening of a shielded cell. The controls for manipulating the shear pass through or along the C-frame. The shear jaw opens to 5 in. in height and 7 in. in width, and the total weight of the tool is only 575 lb. It was used to cut metal sections 4 $\frac{3}{4}$  in. thick and 4-in. schedule-40 stainless steel pipe. (NSA, 1962, #5688)
- 1,558. ELECTRIC DISCHARGE DRILLING BERYLLIUM  
*Light Metal Age*, v. 19, p. 25, December 1961
- 1,559. NEW BIT USES REPLACEABLE CUTTER CONES  
*Petroleum Management*, v. 33, pp. 86-87, December 1961
- 1,560. PINES ENGINEERING COMPANY MACHINE CUTS STEEL, NONFERROUS TUBING  
*Steel*, v. 150, p. 100, January 8, 1962
- 1,561. METAL CUTTING DYNAMOMETER  
Boothroyd, G.  
*The Engineer*, v. 213, pp. 351-353, February 23, 1962
- 1,562. COMPARATIVE EFFECT OF LAND AND CRATER WEAR ON TOOL LIFE WHEN DRY CUTTING, MIST COOLING AND FLOOD COOLING, WITH CARBIDE-TIPPED TOOLS  
Kececioglu, D., Sorensen, A. S., Jr.  
*ASME, Transaction of the, Series B—Journal of Engineering for Industry*, v. 84, pp. 49-52, February 1962
- 1,563. HOW TO ELIMINATE CUTTING TOOL VIBRATION  
Kennicott, W. L., Galimberti, J. M.  
*Tool and Manufacturing Engineer*, v. 48, pp. 77-79, February 1962
- 1,564. JOHNSON HIGH-SPEED METAL-CUTTING MACHINE  
*Machinery*, v. 68, pp. 156, 163, February 1962
- 1,565. PINES-GRIEDER TUBE CUTOFF MACHINE  
*Machinery*, v. 68, p. 200, February 1962
- 1,566. ELECTROMACHINING—ASTME SEMINAR  
*Tool and Manufacturing Engineer*, v. 48, pp. 97-98, February 1962
- 1,567. MACHINE TOOLS: CURRENT RESEARCH AND FUTURE PROSPECTS  
De Barr, A. E.  
*Research*, v. 15, pp. 91-97, March 1962

- 1,568. TWO BLADES CUT CLEAN  
*Product Engineering*, v. 33, p. 71, March 5, 1962

- 1,569. IMPROVEMENTS IN OR RELATING TO APPARATUS AND METHODS, FOR SEVERING CASINGS CONTAINING SOLID MATERIAL  
March 14, 1962  
U.S. Department of Commerce, Washington, D.C.  
British Patent 891,204 (assigned to Commissariat à l'Énergie Atomique)

An apparatus is designed for severing the casings of irradiated reactor fuel elements for subsequent processing. In the operation of the apparatus, the casing is clamped between jaws and likewise between further jaws, and the further jaws and the part of the casing engaged thereby are caused to rotate while the first jaws remain stationary, resulting in a cut of the casing. The apparatus may be operated remotely, e.g., immersed in water. (NSA, 1962 #11,823)

- 1,570. THROWAWAY DRILLS SLASH COST PER HOLE: BROACHED-COLLET EXTENSION  
Meyers, S. L.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 118-119, March 19, 1962

- 1,571. UP-CUT SHEARING MACHINE  
*The Engineer*, v. 213, p. 590, March 30, 1962

- 1,572. SMALL DEEP HOLES DRILLED BY AUTOMATIC USING NOVEL FEED  
Collins, L. W., Jr.  
*Machinery*, v. 68, pp. 94-97, March 1962

- 1,573. PONTIAC TAKES A CLOSER LOOK AT CERAMIC CUTTING TOOLS  
Wick, C. H.  
*Machinery*, v. 68, pp. 83-88, March 1962

- 1,574. SPARK DRILLING MULTI-HOLE JOBS  
Christiana, J.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 69-73, April 2, 1962

- 1,575. LIGHT BEAMS JAB HOLES IN METAL; LASER  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 76-77, April 2, 1962

- 1,576. POSITIVE-RAKE CUT WITH A NEGATIVE-RAKE HOLDER?  
Opila, F. A.  
*American Machinist/Metalworking Manufacturing*, v. 106, p. 107, April 16, 1962

- 1,577. FOUR-BLADE TREPPANNING CUTTER DIVIDES AND CONQUERS  
Wickstrom, L. A., Wiberg, J. T.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 108-109, April 16, 1962

- 1,578. IMPROVEMENTS IN REMOTE CONTROL DEVICES FOR OPENING TUBULAR CONTAINERS  
Douis, M., Jouin, J., Laurent, H., Godart, J., Sougi, M.  
April 26, 1962  
U.S. Department of Commerce, Washington, D.C.  
British Patent 894,929 (assigned to Commissariat à l'Énergie Atomique)

An improved device is designed for the clean opening of a tubular container emitting radiation or containing radio-active materials. The device comprises first means for holding a container, second means for moving a sharp tool to cut the container, and remote control means for controlling the operation of first and second means from behind a protective screen. (NSA, 1962 #16,466)

- 1,579. CARBIDE QUILL SPEEDS GRINDING OF BLIND HOLES  
*American Machinist/Metalworking Manufacturing*, v. 106, p. 124, May 14, 1962

- 1,580. TIMING A PNEUMATIC CUT-OFF SHEAR  
Thompson, C.  
*Hydraulics and Pneumatics*, v. 15, pp. 86-87, May 1962

- 1,581. PLASMA TORCHES CUT METALS WITH ARC-HEATED AIR: SAVE TIME AND EXPENSE  
*Marine Engineering/Log*, v. 67, p. 103, May 1962

- 1,582. BATTERY POWER PACK DRIVES ELECTRIC DRILL  
*Machine Design*, v. 34, p. 12, June 7, 1962
- 1,583. MACHINING WITH A PLASMA JET  
Browning, J. A.  
*American Machinist/Metalworking Manufacturing*, v. 108, pp. 94-95, June 11, 1962
- 1,584. LASERS CAST LIGHT ON MACHINING, WELDING PROBLEMS  
Black, T. W.  
*Tool and Manufacturing Engineer*, v. 48, pp. 85-91, June 1962
- 1,585. FLAME CUTTER DRIVE  
*Automation*, v. 9, p. 93, June 1962
- 1,586. BOREMATION TC MACHINE FOR DEEP-DRILLING EXTRA-LARGE HOLE PATTERNS  
*Machinery*, v. 68, p. 151, June 1962
- 1,587. ANNUAL WHEEL HEAD FOR BROWN AND SHARPE SLICING MACHINE  
*Machinery*, v. 68, pp. 196-197, June 1962
- 1,588. FLAME-CUTTING; THE OLD AND THE NEW  
*Welding Engineer*, v. 47, pp. 41-44, July 1962

## CRUSHING AND GRINDING MECHANISMS AND EQUIPMENT

- 1,589. CONTRIBUTION A L'ÉTABLISSEMENT D'UNE MÉTHODE DE CALCUL DE LA CAPACITÉ DES BROYEURS (ESTABLISHING METHOD FOR CALCULATING CAPACITY OF CRUSHERS)

Huber Panu, I., Popa, E.  
*Revue de Metallurgie*, Bucharest,  
v. 3, no. 2, pp. 59-83, 1958

The method is based on the design and principal dimensions of a crusher, and on considerations of material to crush and the resulting product. The theoretical basis of the applied method and experimental studies are described. (*EI*, 1960)

- 1,590. NOVYE DROBILKI URALMASHZAVODA (NEW CRUSHERS OF URALMASHZAVOD)

Skripov, M. A.  
*Gornyi Zhurnal*, v. 135, no. 5, pp. 45-49,  
May 1959

Characteristics of cone-type and jaw crushers are described. The size of the material they handle and throughput capacities are examined. (*EI*, 1961)

- 1,591. GRINDING AT SUPERCRITICAL SPEEDS

Hukki, R. T.  
*British Chemical Engineering*, v. 4, no. 8-9,  
pp. 446-449, August-September 1959

A report is given on experiments carried out at Mineral Dressing Laboratory of the State Institute for Technical Research, Helsinki, Finland. To obtain greater mill capacity in which material to be ground is also the grinding medium, fundamental conditions for coarse and fine material grinding at sub and supercritical speeds in conventional rod, ball, and autogenous mills are analyzed. Methods for determining mill characteristics and for increasing mill speed are presented. (*EI*, 1960)

- 1,592. EXPERIMENTAL INVESTIGATION OF VIBRATION MILLING

Rose, H. E., Sullivan, R. M. E.  
*British Chemical Engineering*, v. 4, no. 8-9,  
pp. 450-457, August-September 1959

Ball mill variables are analyzed theoretically and mathematically to obtain improved methods for preparation by grinding of very fine powders. Based on results of vibration frequency, mill filling, powder fraction, oscillation, and analysis of powder characteristics and marble grinding, the conditions necessary for effective use of this technique are suggested. (*EI*, 1960)

- 1,593. BALL AND ROD MILL LINERS [FORUM]

Zieman, W. H., Compiler  
*Canadian Mining and Metallurgical Bulletin*,  
v. 52, pp. 511-528, August 1959; (discussion)  
pp. 776-777, December 1959

- 1,594. ISSLEDOVANIE KINETIKI IZMELCHANIYA MELA, TALKA I SLYUDISTOGO SLANTSIA ABRAZIVNYM METODOM (KINETICS OF GRINDING CHALK, TALC, AND MICA SCHIST BY ABRASION METHOD)

Sladkov, A. S.  
*Akademiya Nauk SSSR, Izvestiya Otdelenie Tekhnicheskikh Nauk, Metallurgiya i Toplivo*,  
no. 5, pp. 115-121, September-October 1959

The velocity equation is considered, and a practical coefficient of rock hardness is determined. (*EI*, 1961)

- 1,595. KEEP GRINDING TEMPERATURES LOW TO GRIND CEMENT CLINKER

Takemoto, K., Ito, I., Hirayama, K.  
*Rock Products*, v. 62, pp. 140, 144-146, 148, 154, 156, October 1959

- 1,596. BALL, PEBBLE, AND ROD MILL INSTALLATIONS

Zimmerman, O. T., Lavine, I.  
*Cost Engineering*, v. 4, no. 4, pp. 4-16,  
October 1959

The rotating drum is the most widely used grinding mill and may be either batch or continuous in operation. Features of ball, pebble, rod and tube mills are given as well as open and closed circuit grinding. The initial cost of installation includes installed cost of grinding and

classifying equipment, and any auxiliary equipment necessary. Also considered are the principal cost of grinding operation and power costs. Tables and curves are presented for estimating purposes. (*EI*, 1960)

1,597. UTVIKLINGEN I MOLLEMALING DE SISTE 20 AR (GRINDING IN TUMBLING MILLS DURING THE LAST 20 YEARS)  
Digre, M.

*Tidsskrift for Kjemi, Bergvesen og Metallurgi*, v. 19, no. 7, pp. 146-154, November 18, 1959

A survey is made of developments and progress of grinding in tumbling mills for mineral dressing purposes during the last twenty years. The importance and possibilities of autogenous grinding, hydrocyclone classification and grinding control for present and future improvement are stressed. (*EI*, 1960)

1,598. RETENTION TIME IN CONTINUOUS VIBRATORY BALL MILLING

Fuerstenau, D. W.

*Mining Engineering*, v. 11, pp. 1238-1242; (discussion) pp. 1242-1243, December 1959

1,599. HERE'S A NEW APPROACH TO CRUSHING PROBLEMS

Zacher, W. J.

*Rock Products*, v. 62, pp. 94-96, 98, 126 December 1959

1,600. ERGEBNISSE UEBER VERSUCHE MIT ROHR-, SCHWING- UND STIFTMUEHLEN (TEST RESULTS ON SIZE REDUCTION IN TUBE-, VIBRATING- AND PIN-TYPE MILLS)

Batel, W.

*Teknisk-Vetenskaplig Forskning*, v. 30, no. 6, pp. 246-255, 1959

It is shown how movement of rods and increased gas streaming in tube and vibrating mills influence degree of pulverization. In pin mills this degree is limited not only by the fact that small particles flow around pins with air, but also by the fact that tensile strength of brittle substances increases with decreasing particle size. Use of X-rays to increase or decrease degree of pulverization is discussed. (*EI*, 1960)

- 1,601. VIBRATION MILLS AND THEIR APPLICATIONS  
Gerth, G.  
*Mine and Quarry Engineering*, v. 26, no. 1, pp. 30-32, January 1960

Various types of intermittently and continuously operating German vibration mills are discussed as well as their grinding capabilities on different materials. (*EI*, 1960)

- 1,602. SOIL-CRUSHING MACHINE  
Williamson, W. T. H.  
*Chemistry and Industry*, pp. 224-225, February 27, 1960

- 1,603. SECOND LOOK AT UNIT OPERATIONS; SIZE REDUCTION  
*Canadian Chemical Processing*, v. 44, pp. 78-79, February 1960

- 1,604. ACTION IN A ROD MILL  
Bond, F. C.  
*Engineering and Mining Journal*, v. 161, pp. 82-85, March 1960

- 1,605. TENTATIVA PARA O ESTABELECIMENTO DUMA LEI GERAL DA DISTRIBUICAO GRANULOMETRICA DAS PARTICULAS RESULTANTES DA FRAGMENTACAO (TENTATIVE ESTABLISHMENT OF GENERAL LAW OF GRANULOMETRIC DISTRIBUTION OF PARTICLES PRODUCED BY CRUSHING)  
Naique, R. A.  
*Técnica*, v. 34, no. 300, pp. 335-359, March 1960

A preliminary study of size distribution of particles resulting from various comminution operations is made in order to further experimental confirmation of a new method of study of energy and size distribution relationship. (*EI*, 1961)

- 1,606. GYRATORY CUTS CRUSHING COSTS IN PORTABLES  
*Rock Products*, v. 63, pp. 94-96, April 1960

- 1,607. GYROSCOPIC GRINDING SETUP  
Popper, J. B.  
*Machinery*, v. 66, pp. 136-137, May 1960

- 1,608. PULVERIZE CERAMIC MATERIALS WITH NO MOVING PARTS  
*Ceramic Industry*, v. 75, pp. 56-57, July 1960

- 1,609. TOUGHNESS OF GRINDING SANDS  
Hoffman, R. C.  
*Glass Industry*, v. 41, pp. 483-486, 524, 526, September 1960

- 1,610. NI-HARD GRINDING BALLS FAR OUTLIVE STEEL  
Dixon, R. H. T.  
*Engineering*, v. 190, pp. 598-599, November 4, 1960

- 1,611. PRECISION WITH MULTI-WHEEL GRINDERS  
Jones, F. K.  
*American Machinist*, v. 103, pp. 101-103, November 1960

- 1,612. COMMINUTION THEORY AND PRACTICE  
Kelleher, D.  
*British Chemical Engineering*, v. 5, no. 11, pp. 773-783, November 1960

A review is given which includes a critique of Rittinger's hypothesis (second theory of comminution), critique of Kick's Law (third theory of comminution), and criticism of Bond's Law (fourth theory of comminution). The solution of examples in power requirements and selection of a size reduction unit are also presented. 39 references. (EI, 1961)

- 1,613. REVIEW OF PROGRESS IN MECHANICAL PULPING: SUMMARY OF A LITERATURE REVIEW  
Blinka, J.  
*Tappi*, v. 43, Supplement 196A, December 1960

- 1,614. PORTABLE CRUSHER FOR OPEN PIT AND QUARRY OPERATIONS  
Kochanowsky, B. J.  
*Mining Engineering*, v. 12, no. 12, pp. 1271-1274, December 1960

Gyratory, jaw, roll, hammer, and impact crushers can be used in a portable arrangement. The highest crushing capacity can be obtained with a gyratory crusher, but

its height and necessary heavy foundation are disadvantages for its use as a mobile crusher. (EI, 1960)

- 1,615. VIBRATING MILLS: STURTEVANT VIBRATORY BALL MILL  
*Manufacturing Chemist*, v. 31, p. 545, December 1960

- 1,616. BALL MILLS USING STEEL VS. PEBBLE MILLS [FORUM]  
*Canadian Mining and Metallurgical Bulletin*, v. 54, pp. 87-99, January 1961

- 1,617. ELECTROHYDRAULIC CRUSHER  
Bergstrom, H.  
*Engineering and Mining Journal*, v. 162, no. 2, pp. 134, 136, 138, 140, February 1961

A Soviet comminution device which harnesses forces which result when an electric spark occurs within liquid is discussed. These forces are created by the spark transmitted through liquid and cavitation impact, which results when liquid refills the void created when the spark is extinguished. High pressures, amounting to several hundred atmospheres, break up rocks within the vicinity of the spark. This method appears to be inefficient. (EI, 1961)

- 1,618. BAUFORMEN UND WIRKUNGSWEISE NEUZEITLICHER GROBZERKLEINERUNGSMASCHINEN (TYPES AND FUNCTION OF MODERN MACHINES FOR COARSE CRUSHING)  
Moelling, H. A.  
*Aufbereitungs-Technik*, v. 2, no. 2, pp. 45-63, February 1961

An illustrated systematic survey is presented on actual types of crushers, their function, and essential differences. Fields of action of crushers are plotted in a graph and related to grain sizes, throughput behavior, and corresponding conveying equipment. A scheme of quality index which would permit classification of different types of crushers is considered. (EI, 1961)

- 1,619. MINERALS BENEFICIATION: CRUSHING AND GRINDING  
Windolph, F.  
*Mining Engineering*, v. 13, p. 175, February 1961

1,620. PRIMARY CRUSHER SELECTION

Mabson, L. R.

*Mine and Quarry Engineering*, v. 27, no. 3,  
pp. 114-121, March 1961

Factors to be considered in selecting a primary crusher include characteristics of material to be broken, plant capacity, product size and shape, and factors dependent on method of mining rock or ore. (*EI*, 1961)

1,621. GOUVERNEUR TALC CO.'S DRY BLENDING METHOD FOR FINELY GROUND MATERIALS

McClellan, R. S.

*Mining Engineering*, v. 13, no. 3, pp. 272-273,  
March 1961

Tremolite variety ore coming from a mine is dry ground either by pebble mill circuit or in a fluid energy circuit. Finished grades are pumped in dry state to silos. The material is pumped into the bottom of the silo where continuous mixing of incoming and bed material takes place because silo material is fluidized by incoming air. There is a definite increase in uniformity of shipments. (*EI*, 1961)

1,622. PULPING SOUTHERN PINE INCREMENT CORES BY MEANS OF A SMALL SCALE KRAFT PROCEDURE

van Buijtenen, J. P., Joranson, P. N.,  
MacLaurin, D. J.

*Tappi*, v. 44, pp. 166-169, March 1961

1,623. DETERMINATION OF POWER CONSUMPTION OF GRINDING MILLS IN CEMENT PLANTS

Smith, R. W.

*Mining Engineering*, v. 13, pp. 390-392,  
April 1961

1,624. FLOATING PLANT IN MOBILE BAY PRODUCES CRUSHED, CLEAN OYSTER SHELL

Virtue, J. C.

*Pit and Quarry*, v. 53, no. 10, pp. 94-97,  
April 1961

The plant dredges, washes, and crushes shell. An oyster shell deposit is 10 to 15 ft thick and covered by 10 ft of mud and sand. The dredge has a 32- by 120-ft hull, a 90-ft intake ladder, and a 15-in. pump. A description is given

of roll crushers, rotary screen, and 8-ft-D by 14-ft-long McLanahan and Stone rotary scrubber. All equipment is electrically driven except the wash water pump. Power is supplied by a Delco alternator, driven by two General Motors diesel engines. (*EI*, 1961)

1,625. CRUSHING AND GRINDING CALCULATIONS

Bond, F. C.

*British Chemical Engineering*, v. 6, no. 6,  
pp. 378-385, June 1961; no. 8, pp. 543-548,  
August 1961

Principal calculation methods are summarized. References to articles with more extensive explanation and examples of calculations are included. (June)

Factors affecting the grinding process and the life of equipment are discussed. Effects of mill diameter, of downward slippage of ball charge, and of ratio oversize feed upon performance and power consumption are described. Factors for converting closed-circuit work values to open-circuit values are discussed. (August) (*EI*, 1961)

1,626. STRAHLZERKLEINERUNG UND -TROCKNUNG (JET CRUSHING AND DRYING)

Pierre Korda, E. T. H.

*Aufbereitungs-Technik*, v. 2, no. 6, pp. 230-239,  
June 1961

Efficiency of machines ranges from 50 g to 5 or 10 tph. Energy consumption and wear of machines are rather low, and expenditure of energy for drying purposes is insignificant. Products are not warmed in crushing. The granulation curve is very narrow and fineness of grain is in the micron and submicron range. (*EI*, 1961)

1,627. PORTABLE COAL CRUSHER PERMITS ON-THE-SPOT SAMPLING

*Power Engineering*, v. 65, pp. 62-63, July 1961

1,628. O MEKHANIZME RAZRUSHENIYA GORNYKH POROD TREKHSHAROSHECH-NYM DOLOTOM (MECHANISM OF CRUSHING ROCKS BY THREE ROLLER BIT)

Varlamov, P. S.

*Neftyanoe Khozyaistvo*, v. 39, no. 8, pp. 18-20,  
August 1961

Experiments performed by a tensiometer indicate that crushing of rock by teeth is of a bouncing character. Crushing follows periods of strain created in rock when the limit of strength is reached. Efficiency may be increased when the number of teeth is reduced. Formulas for design of bits are given. Efficiency of drilling in hard rock is increased by increase of spacing and height of teeth. (*EI*, 1961)

1,629. HOW TO MAKE A LARGER ULTRASONIC GRINDING TOOL

Wright, G. E.

*Ceramic Industry*, v. 77, no. 4, pp. 75-76, 89-90,  
October 1961

1,630. BRITISH COLUMBIA CEMENT'S AUTOMATED CRUSHING-BLENDING SYSTEM

Utley, H. F.

*Pit and Quarry*, v. 54, pp. 112-116,  
November 1961

1,631. ELECTROTHERMICS; NEW WAY OF BREAKING ROCK?

*Mining Engineering*, v. 13, p. 1225,  
November 1961

1,632. VIBRATION MILLS AND VIBRATION MILLING—H. E. ROSE AND R. M. SULLIVAN [REVIEW]

Djingheuzian, L. E.

*Canadian Mining and Metallurgical Bulletin*,  
v. 54, p. 898, December 1961

1,633. MODELLVERSUCHE UEBER DEN VERSCHLEISS BEI DER DRUCK- UND DER PRALLZERKLEINERUNG VON MINERALIEN, BESONDERS IM HINBLICK AUF BERGEBRECHANLAGEN (MODEL EXPERIMENTS ON WEAR OF CRUSHERS IN PROCESS OF PRESSURE AND IMPACT CRUSHING OF MINERALS, WITH SPECIAL EMPHASIS ON PLANTS FOR CRUSHING WASTE ROCK)

Wahl, H., Kantenwein, G., Schaefer, W.  
*Bergbau-Archiv*, v. 22, no. 2, pp. 63-90, 1961

Possibilities and limitations of model experiments are presented. A study of effect of rock, incipient size of lumps, and characteristics of a jaw crusher is included. (*EI*, 1961)

1,634. GRINDING MILL RESEARCH IMPROVES EFFICIENCY

Rowland, C. A.

*Rock Products*, v. 65, no. 1, pp. 112, 114-115, 118,  
January 1962

1,635. MINERALS BENEFICIATION IN 1961; CRUSHING AND GRINDING

Brown, J. H.

*Mining Engineering*, v. 14, p. 70, February 1962

1,636. SET IT AND FORGET IT; AUTOMATIC CRUSHING SYSTEM AT MASSACHUSETTS BROKEN STONE CO.

Patterson, W. R., King, D. E.

*Rock Products*, v. 65, no. 2, pp. 100-101,  
104-105, 107, February 1962

## Sweeping and Abrasive Cleaning Mechanisms and Equipment

- 1,637. POWER BRUSHING GAINS  
*Steel*, v. 139, p. 111, November 19, 1956

- 1,638. BLAST CLEANING MACHINE SPEEDS  
SCALE REMOVAL  
McGehee, E. S.  
*Steel*, v. 145, p. 159, December 7, 1959

- 1,639. ROCKET JET SPEEDS BLAST CLEANING  
Browning, J. A.  
*American Machinist*, v. 103, no. 26, pp. 130-131,  
December 14, 1959

A new sand blasting process, developed at Combustion Products Research, Hanover, New Hampshire, has proved to be four times as effective as conventional techniques. A rocket blast from burning gas and compressed air provides high velocity; a conventional air blast system can be easily adapted for rocket use. (*EI*, 1960)

- 1,640. NEW DEVELOPMENTS IN BLAST  
CLEANING  
Powell, G. W.  
*Foundry*, v. 87, pp. 84-87, January 1960

- 1,641. PRESSURE-VACUUM METAL  
BLASTING SYSTEM  
*Compressed Air and Hydraulics*, v. 25, no. 286,  
p. 10, January 1960

An open Vacu-Blast system permits penetration of abrasive into furthest recesses during cleaning of complex shapes and sections, while retaining vacuum local at point of impact. Most of the dust generated in the process is recovered as soon as it is set in turbulence, ensuring better visibility, cleaner working conditions, and simplifying post-blasting vacuum cleaning. Equipment developed by Vacu-Blast fully exploits the pressure-vacuum system. (*EI*, 1960)

- 1,642. AIR TURBINE POWERS ROTARY BRUSH  
IN LIGHTWEIGHT TANK SWEEPER  
*Machine Design*, v. 32, pp. 166-167,  
February 18, 1960

- 1,643. RESIN WHEEL: VACUUM CLEANER  
FAN POWERS NYLON BRUSH  
*Plastics World*, v. 18, p. 38, November 1960

- 1,644. OSBORN POWER BRUSHES FOR  
PRECISION FINISHING  
*Machinery*, v. 67, p. 222, December 1960

- 1,645. CONVAIR GETS MAXIMUM USE FROM  
ITS FLOOR SWEEPERS  
Nesbitt, G. N.  
*Plant Engineering*, v. 15, pp. 96-99, May 1961

- 1,646. MAN-MADE BRISTLES FOR SWEEPING  
*Public Works*, v. 92, p. 158, July 1961

- 1,647. ABRASIVE BLAST CLEANING  
Neustadt, D. E.  
*Metal Finishing*, v. 59, pp. 60-62, September 1961

- 1,648. REID HYDRAULIC SURFACE GRINDER  
SWITCHES FROM HAND TO POWER  
FEED WITHOUT STOPPING  
*American Machinist/Metalworking  
Manufacturing*, v. 105, p. 161, October 16, 1961

- 1,649. SCRAPER CUTS LABOR IN CLEANING  
AIR PREHEATER  
Hesson, S. E.  
*Electrical World*, v. 156, p. 38, October 16, 1961

- 1,650. WHEELABRATOR ABRASIVE CLEANING  
MACHINE TAKES BIG JOBS  
*Steel*, v. 150, p. 103, May 28, 1962

## HANDLING OF MATERIALS BY CRANES

- 1,651. SOLVES HANDLING PROBLEM:  
AUXILIARY, SEMI-GANTRY CRANE,  
PLUS ROLLER CONVEYORS FOR  
OVERHEAD SERVICE  
*Steel*, v. 138, p. 85, January 16, 1956

- 1,652. FLEXIBLE JIB CRANE HAS LONG REACH  
Schuster, L.  
*Electrical World*, v. 150, p. 65,  
November 24, 1958

- 1,653. SPACE-SAVING STACKER CRANE  
*Material Handling Engineering*, v. 15, no. 2,  
pp. 66-67, 129, November 1959

The stacker crane is a combination of an overhead crane and a forklift truck and gives flexibility and mobility in tight areas. It is mounted as a top-running or underrunning crane and consists of a rigid column that extends downward and supports a lifting device. The design characteristics and advantages of different models are listed. (*EI*, 1960)

- 1,654. TEN-TON MAGNET CRANES FOR A  
BEAM MILL  
*The Engineer*, v. 208, pp. 782-784,  
December 11, 1959

- 1,655. MOBILE TOWER CRANES  
*The Engineer*, v. 208, p. 809, December 25, 1959

- 1,656. ENERGETICHESKIE POKAZATELI  
KRANOVOGO ASINKHRONNOGO  
ELEKTROPRIVODA S DROSSELYAMI  
NASYSHCHENIYA (POWER CHARACTER-  
ISTICS OF CRANE INDUCTION MOTOR  
DRIVE WITH SATURABLE REACTORS)  
Osokin, M. N.  
*Elektrichestvo*, v. 80, no. 12, pp. 47-50,  
December 1959  
(English translation available in *Electric  
Technology, USSR*, v. 7, pp. 617-627,  
November 1960)

The system described includes a saturable reactor in stator-circuit, the wound rotor being terminated in sup-

plementary impedances. Energy and power factors are discussed as functions of a normalized shaft load. (*EI*, 1961)

- 1,657. CRANES [ILLUSTRATIONS WITH TEXT]  
*The Engineer*, v. 209, plate 14, January 1, 1960

- 1,658. RATED LOADS FOR MOBILE CRANES  
Davidson, T.  
*SAE Journal*, v. 68, pp. 52-56, January 1960

- 1,659. SELF-ERECTING TOWER CRANE  
*The Engineer*, v. 209, p. 272, February 12, 1960

- 1,660. CONTAINER HANDLING CRANE  
*The Engineer*, v. 209, p. 361, February 26, 1960

- 1,661. TABLE-TOP SHIPYARDS  
*Machine Design*, v. 32, pp. 24-25, March 31, 1960

- 1,662. LIGHT CRANE FOR LONG SPAN:  
ALUMINUM BRIDGE CRANE  
*American Machinist/Metalworking  
Manufacturing*, v. 104, p. 94, May 2, 1960

- 1,663. RUBBER-TYRED TRAVELLING CRANE  
*The Engineer*, v. 209, p. 771, May 6, 1960

- 1,664. STRIPPERKATZE (STRIPPER CAT)  
Billich, J.  
*Oesterreichische Ingenieur Zeitschrift*, v. 3, no. 5,  
pp. 157-159, May 1960

A new crane, called "Stripper Cat," was constructed for steel mills for handling small loads in extremely crowded conditions. The crane weighs 1.5 tons and it is of 3-ton capacity and 35-ton strip-pressure. (*EI*, 1961)

- 1,665. MATERIAL HANDLING SYSTEM MOVES  
PROBLEM BUNDLES: TURNTABLE  
CRANE  
*Steel*, v. 146, p. 119, June 20, 1960

1,666. OM KORTSLUTNING- OG SLEPERINGS-MOTORER FOR DRIFT AV KRANBROER OG KRANVOGNER (SQUIRREL-CAGE AND SLIP-RING MOTORS FOR CRANE OPERATIONS)

Vogt, H. R.

*Elektroteknisk Tidsskrift*, v. 73, no. 17, pp. 283-289, June 27, 1960

Properties and characteristic features of two types of motors are presented, with reference to selection of motor sizes and ratings. Formulas for influence of inertia of moving parts are given. (*EI*, 1961)

1,667. D-C MAGNETIC CRANE HOIST CONTROL FOR A-C POWERED CRANES

Myles, A. H., Davies, M. C., Srnka, L. J.

*AIEE, Transactions of the, Part I—Communication and Electronics*, v. 79, no. 49, pp. 207-211, July 1960

1,668. ROUGH TERRAIN CRANE

*Journal of the Franklin Institute*, v. 270, pp. 158-159, August 1960

1,669. CLIMBING CRANES ERECT SUSPENSION BRIDGE TOWERS

*Engineering*, v. 190, p. 380, September 16, 1960

1,670. STIFF-LEG DERRICK SOLVES MUD PROBLEM ON ST. LOUIS PARKING STRUCTURE

Doyne, M. I.

*Civil Engineering*, v. 30, pp. 56-57, September 1960

1,671. OVERHEAD CRANES WITH PNEUMATIC TYRES

*Mechanical Handling*, v. 47, no. 9, pp. 622-623, September 1960

Aylesford Paper Mills of Reed Paper Group have overhead traveling cranes mounted on five pneumatic tired wheels, which are standard commercial vehicle tires (Michelin X 7.00-20), together with two horizontally mounted solid tired wheels, which bear on the sides of concrete runways to keep cranes running in straight paths. Advantages of the system include operation with only one motor during an emergency, increased speed capa-

bility, and applicability of heavy automotive principles in building carriage assemblies. (*EI*, 1961)

1,672. DESIGN OF A JIB CRANE

Wasil, B. A.

*Plant Engineering*, v. 14, pp. 85-86, October 1960; pp. 85-86, December 1960

1,673. DESIGN OF INDUSTRIAL GEARS

Mutch, R. D.

*Engineering Journal*, v. 43, no. 11, pp. 53-63, November 1960

Methods of crane design are discussed. It is pointed out that existing general gear design methods are difficult to adapt to crane requirements. AGMA specifications apply only to precision cut gearing and do not state what surface finish is used as basis for calculation; the Lewis formula is difficult to apply; British Standards also provide difficulties and find less acceptance in North America. Simplified general calculations are presented for both spur gears and helical gears to be used in cranes. (*EI*, 1961)

1,674. SELECTION OF A-C HOIST MOTORS ON CONTINUOUS DUTY CRANES

Nitsch, A.

*Iron and Steel Engineer*, v. 37, no. 11, pp. 110-113, November 1960

Selection of hoist motors must be made from both torque and thermal standpoint. Torque requirements can be evaluated by standard equations, and thermal ability verified by either rms torque or watt loss calculation, depending on motor enclosure to be used. (*EI*, 1961)

1,675. CRANE COLLECTOR SYSTEM COMBINES COPPER WITH CARBON

*Iron and Steel Engineer*, v. 37, p. 150, November 1960

1,676. SPECIFICATION FOR PERMISSIBLE STRESSES IN CRANES

1960

British Standards Institution, London, England  
British Standard 2573, Part 1

The basis is given for computing stresses in crane structures to secure economy in design and reliability in operation. It includes classification of cranes depending

on their duty and number of hours in service per year. It is suggested that correct classification of the crane is important and should be a joint responsibility of purchaser and manufacturer. (*EI*, 1961)

- 1,677. SPECIFICATION FOR ELECTRIC OVERHEAD TRAVELLING CRANES FOR GENERAL USE IN FACTORIES, WORKSHOPS, AND WAREHOUSES 1960  
British Standard Institution, London, England  
British Standard 466

The standard applies to Classes 2, 3, and 4 ac and dc electric overhead traveling cranes as specified in B.S. 2573 for general use whether indoors, under cover, or exposed to weather. It also relates to underhung jib cranes and rigid mast cranes where applicable. (*EI*, 1961)

- 1,678. CRANES [ILLUSTRATIONS WITH TEXT]  
*The Engineer*, v. 211, plate 4, January 6, 1961

- 1,679. LIGHTWEIGHT OVERHEAD TRAVELLING CRANES  
*The Engineer*, v. 211, p. 100, January 20, 1961

- 1,680. ELECTRIC REMOTE CONTROL OF CRANES WITH THREE-PHASE DRIVES Kleinschmidt, K.  
*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 1, pp. 13-15, January 1961

The impulse control system for three-phase cranes has only one sliding contact control line which can also be used for transmitting report signals or commands in reverse direction. Cranes can be controlled from a stationary or portable command unit on the floor or on a neighboring crane. Synchronism is ensured by the control circuit. (*EI*, 1961)

- 1,681. CRANE DESIGNED FROM FIRST PRINCIPLES  
*Engineering*, v. 191, p. 206, February 3, 1961

- 1,682. TENSION CELL WARNS OF CRANE OVERLOADING  
*Engineering*, v. 191, p. 271, February 17, 1961

- 1,683. HYDROELECTRIC CRANE Morey, W. A.  
*Iron and Steel Engineering*, v. 38, pp. 99-104, February 1961
- 1,684. POLAR CRANE  
*Mechanical Engineering*, v. 83, p. 75, February 1961
- 1,685. CRANE GIRDERS DOUBLE AS CONTROL ENCLOSURES  
*Plant Engineering*, v. 15, p. 121, February 1961

- 1,686. NEW TYPE OF SAFETY DEVICE TO PREVENT COLLISION OF CRANES ON SAME RUNWAY Bethke, F.  
*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 4, pp. 140-142, April 1961

This patented device prevents collision of several cranes traveling on the same runway. A rope extending from the end of the runway to the crane and from one crane to the other unwinds on drums and signals when a predetermined safe distance is reached. (*EI*, 1961)

- 1,687. HOCHBAUKRANE (CRANE FOR CONSTRUCTION) Hille, B.  
*Bauingenieur*, v. 36, no. 4, pp. 121-127, April 1961

Modern crane types used in Germany are reviewed: cranes with telescoping towers; self-erecting cranes and climbing cranes; and cranes with horizontal booms and adjustable angle booms, some equipped with both for alternative use. A graph for determining the loading capacity of booms for various distances is presented. Some of the latest types can handle 1½-ton loads in a 100-m height and at 30-m boom radius. Novel portable remote-control devices are described. (*EI*, 1961)

- 1,688. RADIO REMOTE-CONTROL SYSTEMS FOR CRANES Mursch, B.  
*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 4, pp. 117-118, April 1961

The application of transistorized transmitting and receiving sets as portable sets and traveling crane control

stations is described. Radio remote control can also be used with older cranes if the control system is changed to contactor control. (EI, 1961)

- 1,689. PROVE SUL MODELLO DI UN PORTALE DI GRU GIREVOLI, REALIZZATO CON ELEMENTI A CASSONE (TESTS ON A MODEL OF WELDED BOX TRAVELING GANTRY CRANE)

Finzi, L., Maier, G.

*Tecnica Italiana*, v. 26, no. 3, pp. 179-186,  
April-May 1961

A series of tests were carried out on a 1:10 model of a gantry of a 60-ton 30-m crane, in the elastic range and up to the failure point. A comparison is made between results and theoretical calculations. (EI, 1961)

- 1,690. REMOTE CONTROL CRANE SPEEDS PIPE HANDLING FOR PHILLIPS

*Oil and Gas Journal*, v. 59, p. 97, May 1, 1961

- 1,691. CRANE DESIGN PAYS OFF IN PERFORMANCE; PRESSURIZED CORRIDOR INSIDE GIRDER

*Steel*, v. 148, p. 67, May 1, 1961

- 1,692. NEW CRANE HAS WALK-IN GIRDER

*Iron Age*, v. 187, p. 96, May 4, 1961

- 1,693. TUBULAR JIB DESIGN FOR DRY DOCK CRANE

*Engineering*, v. 191, p. 636, May 5, 1961

- 1,694. NEW CRANES HAVE PRESSURIZED WALK-IN GIRDERS

*Iron and Steel Engineer*, v. 38, pp. 169-170, May 1961

- 1,695. MOBILE CRANES

*The Engineer*, v. 211, p. 959, June 9, 1961

- 1,696. MOTORIZED TENDER PUSHES MOBILE CRANE

*Machine Design*, v. 33, p. 153, June 22, 1961

- 1,697. REMOTE CONTROL GANTRY CRANE HANDLES HEAT TREATING LOADS

*Steel*, v. 148, pp. 72-73, June 26, 1961

- 1,698. UN ENGIN MODERNE POUR LA POSE OU LA DÉPOSE DE TRAVURES POUR VOIES FERRÉES (MODERN EQUIPMENT FOR POSITIONING AND REMOVING TRACK PANEL LENGTHS AND SUPPORTS)

Bouillon, R.

*Revue Générale des Chemins de Fer*, v. 80, pp. 325-332, June 1961

This self-propelled vehicle consists of a control body mounted on four trucks and carrying two symmetrical jibs; one jib bears the track panel and the other bears the counterweight. (EI, 1961)

- 1,699. NEW FORM OF CRANE-HOIST CONTROL USING 3:1 POLE-CHANGING INDUCTION MOTOR

Butler, O. I., Ahmad, V.

*Institution of Electrical Engineers, Proceedings of the, Part A—Power Engineering*, v. 108, pp. 215-224, June 1961

In conjunction with a single-phase auto-transformer, a pole-changing motor enables best use to be made of dc and ac dynamic braking; this further assists in reducing energy dissipation in motor circuits and reducing number and size of secondary-circuit resistors and contactors. 25 references. (EI, 1961)

- 1,700. NEW CRANE HOIST CONTROL

West, R. A.

*Institution of Electrical Engineers, Proceedings of the, Part A—Power Engineering*, v. 108, pp. 224-225, June 1961

- 1,701. NEW METHODS OF MOUNTING CRANE RAILS ON OVERHEAD RUNWAYS

Senior, A. G.

*Iron and Steel Engineer*, v. 38, no. 7, pp. 132-134, July 1961

Methods developed and proved in service in heavy duty steel mills involve continuous rails, soft mounted on grooved rubber pads and fixed by spring clips. Smoother running of cranes was achieved, with reduced impact effects and ease of track realignment. (EI, 1961)

- 1,702. FLYING CRANE ALMOST LIFTS ITS WEIGHT IN PAYLOAD

*Machine Design*, v. 33, pp. 98-99, August 31, 1961

1,703. STOTHERT AND PITT DD2

DOCKSIDE CRANE

*Engineering*, v. 192, no. 4980, pp. 422-424,  
September 29, 1961

Information is presented on DD2-type cranes, 92 of which have been ordered by Port of London Authority. One feature is "large member" welded construction of tower and jib; the welded jib is of hollow tubular members. A single hydraulic ram is used for luffing. A pintle tube is attached to a superstructure which houses a spiral staircase. The machinery house and driver's cabin are mainly of resin bonded glass fiber; the cranes are for either 10'1" or 13'6" gage. A diagram is given. (*EI*, 1961)

1,704. TOWER CRANE BOOTSTRAPS ITSELF  
WITH AID OF A JACKSCREW  
[ILLUSTRATIONS WITH TEXT]

*Machine Design*, v. 33, pp. 186-187,  
October 12, 1961

1,705. MOBILE CRANE OF FOUR TONS  
NOMINAL CAPACITY

*The Engineer*, v. 212, no. 5516, p. 620,  
October 13, 1961

1,706. SAFETY DEVICES FOR TOWER CRANES

*Engineering*, v. 192, no. 4982, p. 464,  
October 13, 1961

1,707. ERGONOMIC THINKING IN CRANE  
CAB DESIGN

Sell, R. G., Box, A. W., Leyshon, K.  
*Engineering*, v. 192, no. 4983, pp. 494-495,  
October 20, 1961

Ergonomic principles were considered in the design of a cab for an overhead crane to be used in a rod mill warehouse. Factors involved included position of cab along crane girders, visibility, layout of controls and cab interior. An analysis was made by the British Iron & Steel Research Association. (*EI*, 1961)

1,708. SAFETY DEVICES FOR TOWER CRANES

*The Engineer*, v. 212, no. 5517, p. 657,  
October 20, 1961

1,709. CABLE CRANE WITH TILTING MASTS

*The Engineer*, v. 212, no. 5517, p. 667,  
October 20, 1961

The Cruciani system for erection of large span centering arches of bridges is described. Swinging masts or "falcons" consist of tubular struts braced by external wire stays. Simple elements can be combined to form masts of up to 20 m long, while higher masts can be built using additional cross pieces and stays. This system has the advantage of lightness, e.g., a 2-ton capacity crane of 400-m span, with masts 32 m high, can be carried on a truck with trailer. (*EI*, 1961)

1,710. TWO NEW, FULLY HYDRAULIC  
GRABBING CRANES

de Ries, J.

*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 10, pp. 363-365, October 1961

Characteristics are described of two new hydraulic, level luffing, double girder, grabbing cranes employed at Port of Ostend. Maximum capacity of the cranes is 8 tons at 27.5-m maximum radius with 48 m/min traveling speed. All movements of cranes except traveling are hydraulic. (*EI*, 1961)

1,711. CALCULATION OF LOAD MOMENT  
PROTECTION DEVICES FOR  
FLOATING CRANES

Duemcke, G.

*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 10, pp. 377-380, October 1961

An example shows how a protection device is calculated and designed. Determination of load moment is considered; a fictitious load moment limit is introduced to ensure constant safe load moment limit. Load radius is determined through use of a pendulum which actuates a potentiometer; load is determined with load cells. A practical application of the results is given. (*EI*, 1961)

1,712. A-C, D-C CRANE COMBINES ECONOMY  
AND PERFORMANCE

*Iron and Steel Engineer*, v. 38, p. 182,  
October 1961

1,713. ROBOT CRANES CONTROL STORAGE

*Modern Materials Handling*, v. 16, pp. 98-99,  
October 1961

- 1,714. ELECTRICAL EQUIPMENT FOR  
FLOATING CRANE  
Derrington, J. G. F.  
*G. E. C. Journal*, v. 28, no. 1, pp. 31-34,  
1960-1961

A diesel electric floating crane, "Samson," was built by Simons-Lobnitz, Ltd., of Renfrew, Scotland. This crane was designed specifically to meet difficult conditions at Port of Liverpool which demand both relatively high speed to cope with tidal currents and maximum maneuverability. Power equipment, propulsion motors, hoisting and derrick motors, slewing and ballast motors, and control cabin are described. (*EI*, 1961)

- 1,715. CRANE GETS BOARDINGHOUSE REACH  
*Engineering News-Record*, v. 168, p. 56,  
January 4, 1962

- 1,716. CRANES [ILLUSTRATIONS WITH TEXT]  
*The Engineer*, v. 213, p. 85, January 12, 1962

- 1,717. 150-FT CRANE THREADS POLE DOWN  
THROUGH HOT LINES  
*Electrical World*, v. 157, p. 72, February 5, 1962

- 1,718. TALL CRANE CHANGES BURNED-OUT  
FLARE TIPS  
*Oil and Gas Journal*, v. 60, pp. 108-109,  
February 5, 1962

- 1,719. FOLDING JIB RIGGED TO UP CRANE  
HEIGHT 18 FT  
Stinson, T. W., Jr.  
*Electrical World*, v. 157, p. 58, February 19, 1962

- 1,720. UN-MANNED CRANE FEEDS  
PRODUCTION  
*Modern Materials Handling*, v. 17, pp. 86-87,  
March 1962

- 1,721. CRANE LOAD STABILITY TEST HINGES  
ON BALANCE CAPACITY  
*SAE Journal*, v. 70, pp. 66-69, March 1962

- 1,722. CRANE OF THE FUTURE  
Blum, F. M.  
*Iron and Steel Engineer*, v. 39, pp. 132-137;  
(discussion) pp. 137-138, April 1962

- 1,723. CRANE DRIVES  
*Iron and Steel Engineer*, v. 39, pp. 253-254,  
April 1962

- 1,724. LATEST ADVANCES IN OVERHEAD  
CRANE DESIGN  
*Modern Materials Handling*, v. 17, p. 101,  
April 1962

- 1,725. WHAT'S NEW IN HEAVY DUTY  
MATERIAL HANDLING: BRIDGE CRANE,  
GANTRY, SERPENTINE BELT CONVEYOR  
*Plant Management and Engineering*, v. 24,  
pp. 31-33, April 1962

- 1,726. SOMETHING DIFFERENT IN REACTOR  
CRANE CONTROL  
Schurr, C. A.  
*Iron and Steel Engineer*, v. 39, pp. 91-100;  
(discussion) pp. 100-103, May 1962

- 1,727. LONG-ARMED CRANE  
*Architectural Forum*, v. 116, p. 47, May 1962

- 1,728. 1962 MATERIALS HANDLING AND  
PACKAGING DIRECTORY: OVERHEAD  
EQUIPMENT  
*Modern Materials Handling*, v. 17, pp. 275-308,  
May 1962

- 1,729. MOTOR HEATING EFFECTS OF  
REACTOR-TYPE CONTROL SYSTEMS  
FOR A-C CRANES  
Halvorson, J. A.  
*Iron and Steel Engineer*, v. 39, pp. 124-130;  
(discussion) pp. 131-132, June 1962

## PACKAGING, LOADING, AND GENERAL HANDLING OF MATERIALS

- 1,730. MATERIAL PREPARATION FOR AUTOMATIC COMPOUNDING, MIXING, AND PELLETIZING  
Hale, A.  
*Rubber Age*, v. 78, pp. 393-394, December 1955  
(See also *Rubber World*, v. 133, pp. 524-526, January 1956)
- 1,731. HOW TO HANDLE SAWDUST FOR PACKING  
Westbrook, F. A.  
*Mill and Factory*, v. 58, p. 121, January 1956
- 1,732. MATERIALS HANDLING: WHAT'S AROUND THE CORNER? FORK TRUCKS, YARD EQUIPMENT, CONVEYORS IN 1966  
McKee, D. W.  
*Mill and Factory*, v. 59, pp. 84-86, July 1956
- 1,733. ESCAPEMENTS FOR AUTOMATIC EQUIPMENT  
Treer, K. R.  
*Automation*, v. 4, no. 2, pp. 80-86, February 1957
- Basic types of industrial escapements are discussed, including ratchet, slide, drum, gate displacement, and jaw-type escapements. Requirements for the application of these mechanisms to automatic equipment, whether cyclic or continuous in operation, for materials handling, and feed systems are considered. (*EI*, 1957)
- 1,734. HALF-A-DOZEN HANDLING HIGHLIGHTS [ILLUSTRATIONS WITH TEXT]  
*Factory Management and Maintenance*, v. 115, pp. 90-91, February 1957
- 1,735. TELESCOPING BOOM MAKES IT POSSIBLE TO UNLOAD DIRECTLY FROM TRUCKS  
*Mill and Factory*, v. 61, p. 129, July 1957
- 1,736. 18 WAYS TO MOVE PARTS IN A FURNACE  
Beggs, D.  
*Steel*, v. 142, pp. 90-91, June 23, 1958
- 1,737. 30 WAYS TO HANDLE DIES  
Weiss, H. G.  
*Modern Materials Handling*, v. 13, pp. 96-101, June 1958
- 1,738. EXTRUSION HANDLING SYSTEMS SAVE MONEY, TIME  
Darby, K.  
*Modern Metals*, v. 14, pp. 66-71, July 1958
- 1,739. 11 NEW SOLUTIONS TO TOUGH HANDLING PROBLEMS: LATEST TRUCKING EQUIPMENT, IN-PLANT MOVERS SEEN AT HANDLING SHOW  
Ziembra, J. V.  
*Food Engineering*, v. 30, pp. 78-79, December 1958
- 1,740. MASS HANDLING OF MATERIALS  
Majumdar, S. K., Lahiri, A.  
*Journal of Mines, Metals and Fuels*, v. 7, no. 10, pp. 1-7, 13, October 1959
- Transportation, handling, and storage of coal, and the machinery employed, such as belt conveyors, ropeways, stackers, jib loaders, draglines, motorized industrial trucks, and hydraulic and pneumatic conveyors, are discussed. The mechanization in Indian coal mining industry and progress in coal storage and preparation are also considered. (*EI*, 1960)
- 1,741. 19 UNITS TO EASE HANDLING: NEW MOVING DEVICES AT MECHANICAL HANDLING SHOW IN CLEVELAND  
*Food Engineering*, v. 31, pp. 80-81, October 1959
- 1,742. 1960 FORUM ON TECHNICAL PROGRESS: HANDLING AND PACKAGING  
*Steel*, v. 146, pp. 306-308+, January 4, 1960
- 1,743. HOW TO KEEP PRODUCTION HOPPING  
*Mill and Factory*, v. 66, no. 1, p. 122, January 1960
- Roura self-dumping hoppers used at the Whirlpool-Seeger Corp. plant to solve some material handling and most scrap handling problems are discussed. Operations involving the hoppers are described and illustrated. (*EI*, 1960)

- 1,744. ROTARY STORAGE AND DISPENSING MACHINE FOR SMALL COMPONENTS  
*Compressed Air and Hydraulics*, v. 25, no. 286, pp. 24-25, January 1960

A rotassembler is a rotary indexing machine which can store 38 different electric components used in radio and television production, and dispense them from vertical hoppers in correct assembly sequence only inches from the assembly area. The 20 machines in present use at Regentone Radio & Television, Ltd., have replaced fixed bins, resulting in labor and space saving. Design and construction details are fully described for a compressed air operated machine. (*EI*, 1960)

- 1,745. TURNOVER DEVICE HANDLES SLABS  
*Iron Age*, v. 185, p. 153, February 11, 1960

- 1,746. UNIT OPERATIONS REVIEW:  
MATERIALS HANDLING  
Arwood, J. R., Wesson, R. W.  
*Industrial and Engineering Chemistry*, v. 52, pp. 181-182, February 1960

- 1,747. SECOND LOOK AT UNIT OPERATIONS:  
MATERIALS HANDLING  
*Canadian Chemical Processing*, v. 44, p. 76, February 1960

- 1,748. WHAT TO CONSIDER IN SELECTING  
WHEEL-TYPE LOADERS  
Clark, H. D.  
*Modern Materials Handling*, v. 15, no. 3, pp. 111-113, March 1960

Mobility and speed make wheel loaders ideal for bulk handling. Selection should be based on an analysis of production needs, productive capacity of loader, cost, and availability of maintenance parts and service. As an aid in selection two aspects are considered: (1) loader components, which include bucket capacity, lifting capacity, and bucket operating speed; and (2) chassis components, which include engine power ratings, physical size and weight, and work and travel speeds. (*EI*, 1960)

- 1,749. APPLICATION OF VIBRATORY POWER  
TO MECHANICAL HANDLING  
Lathan, J. D.  
*Mechanical Handling*, v. 47, no. 3, pp. 132-135, March 1960

Consideration is given the use of a Vibromotor and membrane plate installed inside a concrete structure to

assist in output flow of materials. Vibrating screens and chutes, feeders and conveyors, spiral elevators, and vibrating tables are discussed. Applications range from food and chemical industries to foundries and cement or other powder materials plants. (*EI*, 1960)

- 1,750. KEEPING UP WITH MATERIALS  
HANDLING DEVELOPMENTS  
[ILLUSTRATIONS WITH TEXT]  
*Safety Maintenance*, v. 119, pp. 48-49, March 1960

- 1,751. EIGHT SMART HANDLING IDEAS  
FROM A NEW PLANT  
*Modern Materials Handling*, v. 15, pp. 102-105, April 1960

- 1,752. MATERIALS HANDLING  
*Consulting Engineer*, v. 14, no. 4, pp. 103-126, April 1960

This staff report contains sections on the role of the consultant, planning of a new plant, remodeling of an old plant, and special problems. Examples are included of existing projects relating to materials handling of unit loads and of aggregate, sand and gravel, coal, wood chips, and other bulk materials. An automated warehouse is described. (*EI*, 1960)

- 1,753. NEAR AUTOMATIC PICKING, SORTING,  
LOADING  
*Modern Materials Handling*, v. 15, pp. 90-93, April 1960

- 1,754. MANUFACTURING/MAINTENANCE  
KNOW-HOW HANDBOOK: MATERIAL  
HANDLING EQUIPMENT; LATEST  
TRENDS, MANUFACTURING AND  
MAINTENANCE CASE STUDIES, NEW  
PRODUCT INFORMATION  
*Mill and Factory*, v. 66, pp. 231-256+, May 1960

- 1,755. PARTS HANDLING SYSTEM ELIMINATES  
MANUAL LOADING  
*Automation*, v. 7, pp. 71-73, May 1960

- 1,756. NEW DIMENSION IN MATERIALS  
HANDLING: IDEAS, NOT HARDWARE  
Drake, C. W.  
*Mechanical Engineering*, v. 82, pp. 71-73, June 1960

- 1,757. CONTAINERS, EMPTY AND FULL  
HANDLED WITHOUT HANDS  
Gaudreau, A. T.  
*Plant Engineering*, v. 14, pp. 148-152, June 1960
- 1,758. ANALYTICAL METHODS BRINGING  
BREAK-THROUGHS IN MATERIALS  
HANDLING  
Hayes, E. J.  
*SAE Journal*, v. 68, pp. 51-52, June 1960
- 1,759. AUTOMATIC HANDLING AND STORAGE  
*Engineering Journal*, v. 43, pp. 102-103,  
June 1960
- 1,760. STRADDLE CONCEPT SLASHES  
LOADING TIME  
*Modern Materials Handling*, v. 15, pp. 88-89,  
June 1960
- 1,761. PANORAMA OF ADVANCED MATERIALS  
HANDLING TECHNIQUES; LINK-BELTS  
NEW BEARING PLANT  
*Modern Materials Handling*, v. 15, pp. 84-88,  
July 1960
- 1,762. NEWEST HANDLING SUCCESS STORY  
Ziemba, J. V.  
*Food Engineering*, v. 32, pp. 66-68, August 1960
- 1,763. NEW METHOD OF CARLOADING  
IS TESTED  
*Modern Materials Handling*, v. 15, p. 103,  
September 1960
- 1,764. TRIPLE-DECKER STORAGE LAYOUT:  
BOON TO BROKEN PACKAGE  
STOCK PICKING  
Bauman, J. S., Bischel, J. W.  
*Modern Materials Handling*, v. 15,  
pp. 107-109, September 1960

To meet the needs of telephone companies for daily shipment of apparatus and equipment, Western Electric Co., Chicago, Ill., Distributing House uses a shelving arrangement of four continuous banks, each about 300 ft long, extending to the ceiling area. Two operating units, used to select the stock from the second and third tiers, comprise the selector's platform, telescoping columns,

trolley, trolley rails, and electrical equipment. Operating procedures and savings are discussed. (*EI*, 1961)

- 1,765. MECHANIZED BOTTLING PLANT  
Potter, D. M.  
*Mechanical Handling*, v. 47, no. 9, pp. 580-587,  
September 1960

The bottling line at Hope and Anchor Breweries, Sheffield, which uses fork trucks and pallets, conveyors, and a process plant incorporating work moving members, is examined. General plan of operation is for empty bottles to be received in crates; bottles are separated from the crates to be washed and refilled, and then positioned to rejoin the empty crates. (*EI*, 1961)

- 1,766. IS THERE A CAR SHAKER IN YOUR  
FUTURE? SUCH DEVICES MAY BE  
USEFUL IN RUBBER PLANTS FOR  
UNLOADING GRANULAR MATERIALS  
Gahl, E. A.  
*Rubber World*, v. 143, pp. 100-101,  
October 1960

- 1,767. REMOTE CONTROL LOADER  
Hays, R.  
*Engineering and Mining Journal*, v. 161,  
pp. 106-107, October 1960

- 1,768. COMPLETE AUTOMATION FOR  
UNLOADING, HANDLING, BATCHING,  
AND MIXING RAW MATERIALS  
Waters, M. R.  
*American Ceramic Society Bulletin*, v. 39,  
pp. 511-512, October 15, 1960

- 1,769. MECHANICAL EGG HANDLING  
*Food Engineering*, v. 32, no. 10, pp. 89-90,  
October 1960

Grading and packaging of eggs at San Diego, California Co-op Poultry Association are discussed. An automatic line features a flight conveyor that moves the eggs across the scales and ejects the products onto transverse orienting conveyors. An electric eye actuates the next flight conveyor which delivers the eggs to the carton packer. Cartons are positioned under the carton packer, and a take-away belt moves the filled cartons to a common conveyor. An electric eye controls converging traffic. (*EI*, 1961)

- 1,770. AUTOMAZIONE DELLA ALIMENTAZIONE DEI LINGOTTI AI FORNI ROTATIVI (AUTOMATION OF THE FEEDING OF INGOTS TO ROTATING FURNACES)  
Raimondi, R.  
*Metallurgia Italiana*, v. 52, no. 11, pp. 721-726, November 1960

An illustrated description is given of an automatic system for weighing ingots and conveying them to a rotary heating furnace in a seamless pipe mill. The sequence of movements and the control system are examined. (*EI*, 1961)

- 1,771. CARLOAD SUGAR HANDLING; ROTARY CAR DUMPER  
*Mechanical Engineering*, v. 82, p. 89, November 1960

- 1,772. PALLETLESS SYSTEM SPEEDS LOADING  
*Modern Materials Handling*, v. 15, p. 113, November 1960

- 1,773. MECHANIZATION'S ELEVEN HOTTEST TRENDS  
Bright, J. R.  
*Modern Materials Handling*, v. 15, pp. 72-76, December 1960

- 1,774. COLLAPSIBLE CONTAINERS  
Brown, N. H., Jr.  
*Mechanical Engineering*, v. 82, pp. 54-55, December 1960

- 1,775. MECHANICAL HANDLING EQUIPMENT [ILLUSTRATIONS WITH TEXT]  
*The Engineer*, v. 211, plate 5, January 13, 1961

- 1,776. AUTOMATED MATERIAL CONTROL  
Shenton, D. W., Gleixner, H.  
*Automation*, v. 8, pp. 50-59, January 1961

- 1,777. MATERIALS HANDLING IN ARMY  
Tobin, C. J.  
*Institute of Materials Handling, Journal of the*, v. 1, no. 2, pp. 418-427, January 1961

Materials handling methods in the British army are reviewed, such as parcelling, pallets, containers, cranes, forklift trucks, and air transport. (*EI*, 1961)

- 1,778. UNIT OPERATIONS REVIEW: MATERIALS HANDLING  
Arwood, J. R.  
*Industrial and Engineering Chemistry*, v. 53, pp. 159-160, February 1961

- 1,779. MAGNETIC PROTECTION EQUIPMENT FOR COAL-HANDLING SYSTEMS  
Buus, H. W.  
*Power Engineering*, v. 65, pp. 72-74, February 1961

- 1,780. HANDLING HIGHLIGHTS FROM THE GOLDEN GATE  
Dean, F. P.  
*Modern Materials Handling*, v. 16, p. 87, February 1961

The handling methods discussed are concerned with sugar refining.

- 1,781. FIVE PRINCIPLES GUIDE SMALL-PLANT HANDLING  
Lyons, R. T.  
*Modern Materials Handling*, v. 16, pp. 92-93, February 1961

- 1,782. WHAT DO YOU KNOW ABOUT BIN DESIGN?  
Tanaka, T.  
*Rock Products*, v. 64, no. 2, pp. 115-116, 118-120, 124, 126, February 1961

Gravity flow of particles from hopper bottoms of bins is discussed. A general equation is derived which represents the law governing the gravitational flow of granular materials through hopper outlets. Effects of factors of cone angle, arching of material, particle size, and size of opening are considered. (*EI*, 1961)

- 1,783. APPLICATION OF WEIGHT CONTROLLERS TO THE AUTOMATIC HANDLING OF BULK MATERIALS  
Young, W. M.  
*Rubber Age*, v. 88, pp. 803-809, February 1961

- 1,784. EQUIPMENT FOR PROCESSING, 1961: DRY PROCESSING AND MATERIALS HANDLING  
*Canadian Chemical Processing*, v. 45, p. 85, February 1961

- 1,785. VINYL SAUSAGES FOR STORING GRAIN  
*Plastics World*, v. 19, p. 55, February 1961

*Wire and Wire Products*, v. 36, no. 5,  
pp. 581-582, May 1961

- 1,786. DRY BULK HANDLING CREATES  
EQUIPMENT DEMAND  
*Chemical and Engineering News*, v. 39,  
pp. 58-60, March 20, 1961

A unique use of a modified excavator to unload rod coils from gondola cars at Colorado Fuel & Iron Corp's Wickwire Spencer Steel Div., Palmer, Mass., is described. Savings in time and handling costs are obtained. (*EI*, 1961)

- 1,787. RESEARCH IN BULK MATERIALS  
HANDLING  
Erisman, M. J.  
*Mechanical Engineering*, v. 83, pp. 55-59,  
March 1961

1,792. MECHANIZATION KNOW-HOW  
HANDBOOK: MATERIAL HANDLING  
EQUIPMENT  
*Mill and Factory*, v. 68, pp. 125-142+, May 1961

- 1,788. POLYSTYRENE SILAGE: BULK-HANDLING  
SYSTEM FOR PELLETS  
*Plastics World*, v. 19, pp. 16-17, March 1961

1,793. SEVEN WAYS TO GET EFFICIENCY  
FROM MATERIALS HANDLING  
*Iron Age*, v. 187, pp. 67-69, June 29, 1961

- 1,789. CHIP HANDLING AND STORAGE —  
OVERALL VIEW  
Wilson, F. G., Green, C. E.  
*Paper Trade Journal*, v. 145, no. 15, pp. 38-45,  
April 10, 1961

Advantages and disadvantages of various systems used in transporting and storing chips are discussed. Considered are various types of conveying systems for handling chips in mill, transport of chips from outside sources, storage facilities, and handling methods. Suggestions are made for minimizing bridging in storage and spillage in transport. (*EI*, 1961)

1,794. MODERN MATERIALS HANDLING VITAL  
TO LOW OPERATING COSTS  
*Engineering and Mining Journal*, v. 162,  
pp. 232-233, June 1961

- 1,790. INTERKAMA EXHIBITION 1960  
Lorenzen, H. W.  
*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*),  
no. 4, pp. 132-134, April 1961

1,795. BERICHT UEBER DIE DEUTSCHE  
INDUSTRIEMESSE 1961 IN HANNOVER  
(REPORT ON GERMAN INDUSTRIES  
FAIR, HANOVER, 1961)  
*Werkstattstechnik*, v. 51, no. 7, pp. 351-380,  
July 1961

The following papers are included in this report: "Devices for Mechanization and Automation," by W. Deppert, pp. 351-365; "Some Data Processing Installations," by W. Dutschke, pp. 365-371; "Tools and Instruments," by D. Stumpp, pp. 371-375; and "Warehouse Installations and Conveying Equipment," by D. Stumpp, pp. 375-380. (*EI*, 1961)

- A report is presented on equipment related to handling, conveying, and automation shown at the 1960 Duesseldorf INTERKAMA Exhibition (International Congress and Exhibition for Mechanical Handling and Automation). Load meters, bulk goods proportioning devices, bin charge meters, automatic devices for lifts, and photoelectric control equipment for material handling systems are discussed. (*EI*, 1961)

1,796. EXTRUDER SLASHES SCRAP HANDLING  
TIME 50 PER CENT WITH SELF-  
DUMPING HOPPERS  
*Modern Metals*, v. 17, p. 58, July 1961

- 1,791. WIRE MILL SOLVES MATERIAL  
HANDLING PROBLEMS WITH  
CONSTRUCTION MACHINE  
Crimmins, T. D.

1,797. SIMPLE FIXTURES SWING PARTS  
THROUGH HEAT-TREAT LINES  
*Iron Age*, v. 188, pp 70-71, August 3, 1961

1,798. ORE-HANDLING INSTALLATION  
*Colliery Guardian*, v. 203, no. 5236,  
pp. 228-229, August 24, 1961

A new sinter plant and an ore-handling installation have been designed to handle 600 tph of run-of-mine ore. The equipment includes a 60-ton side-discharge car tippler, crushers, conveyors, screens, and feeders. Three types of ore are handled in the new plant: Lincolnshire (Navvy); Northamptonshire (Northants); and French. Northants ore requires drying before screening and tertiary crushing. A flow diagram of the sinter process and coke handling is included. (EI, 1961)

- 1,799. REMOTE PLASTIC BAG PASSOUT UNIT FOR HIGH-LEVEL RADIOCHEMICAL OPERATIONS  
Fleischer, E. S., Parsons, T. C., Howe, P. W.  
August 1961  
California, University of, Lawrence Radiation Lab., Berkeley  
UCRL-9660, W-7405-eng-48

A system is designed for making remote sealed-bag passouts from a multicurie-level chemistry processing enclosure. The polyethylene bags are changed remotely without exposing contaminated surfaces while always maintaining a low leak rate seal. The system employs an interchange box (passout box) attached to the chemistry enclosure. Integrated with the box is a hydraulically operated jack that raises and lowers the bags, and a welder-cutter for sealing them. A single master-slave manipulator teamed with the above units handles all operations. (NSA, 1962, #3034)

- 1,800. NEW ELECTRICALLY OPERATED TRAVELLING ORE UNLOADER FOR CARGO FLEET IRON WORKS  
*Metallurgia*, v. 64, no. 382, pp. 76-78,  
August 1961  
(See also *British Steelmaker*, v. 27, no. 9, pp. 285-286, September 1961; *Iron and Steel*, v. 34, no. 11, pp. 476-477, August 1961)

General features of the 13½-ton (gross capacity) unloader designed and constructed by Wellman Smith Owen Engineering Corp., are discussed. The following are considered: loading facilities, structural design, long travel and rail clamps, trolley, boom hoist, spotting hopper and conveyor, and electrical equipment. (EI, 1961)

- 1,801. GLUING OF PAPER BAGS TO PALLETS—NEW METHOD OF SECURING LOADS  
Buehler, F.

*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*), no. 9, p. 336, September 1961

Paper bags containing a finely granulated product are stacked on pallets and glued to each other with special glue, which crystallizes on setting, so that bags are not damaged when separated. (EI, 1961)

- 1,802. GETTING "DIFFICULT" MATERIALS OUT OF BINS  
Sinden, A. D.

American Society of Mechanical Engineers, New York, N. Y.  
Paper 61-BSH-8, presented at ASME Meeting, October 17-18, 1961

Certain characteristics of materials make outflow by gravity alone impractical in bottom-discharging bins. Comparative tests are reported of various bin-discharging devices with special emphasis on apparatus called "planetary arch breaker." (EI, 1961)

- 1,803. CONTAINERIZATION METHODS IN BULK MATERIAL HANDLING  
Ackerman, C. D.  
*Plant Engineering*, v. 15, pp. 122-125, October 1961

- 1,804. AUTOMATIC HANDLING FOR SPRAYING LINES  
*Engineering*, v. 192, p. 585, November 3, 1961

- 1,805. AUTOMATION OF FREE FLOWING SOLIDS  
Valenti, F.  
*Canadian Mining and Metallurgical Bulletin*, v. 54, no. 595, pp. 833-834, November 1961

A device which provides flow rate information can easily determine material inventory and production rates, and provides means for developing product stability by controlling, for example, flow rate to grinding mill or crusher. The applications of automatic control of flow rate to iron ore sintering and pelletizing are discussed. Completely integrated weighing feeders are now being produced, which provide design features formerly unattainable in the heavy materials handling field. (EI, 1961)

- 1,806. STANDARDIZED ASSEMBLY MACHINERY  
*Automobile Engineer*, v. 51, no. 11, pp. 438-441,  
November 1961

Basic types of equipment produced by the Gilman organization are Transferline, designed for in-line operation and high-volume production, and Indexomatic, a rotary machine for a small number of assembly operations. Built from standardized units on the building block principle, they can be used to assemble a wide range of components, from electronic units to heavy automobile parts. Details of the basic unit of the Transferline range and the Indexomatic range are included. (*EI*, 1961)

- 1,807. ROTARY MACHINE BOOSTS PRODUCTION  
FIVEFOLD: ROTOSERT  
*Steel*, v. 149, pp. 131-132, December 18, 1961

- 1,808. CLAY HANDLING INSTALLATION  
*The Engineer*, v. 213, pp. 364-365,  
February 23, 1962

- 1,809. MODERN TRENDS IN MATERIALS  
HANDLING SYSTEMS  
Raff, W. H.  
*Iron and Steel Engineer*, v. 39, pp. 86-90,  
February 1962

- 1,810. DE-PALLETIZERS BRIDGE GAP  
BETWEEN DIFFERENT HANDLING  
SYSTEMS  
*Modern Materials Handling*, v. 17, pp. 64-67,  
February 1962

- 1,811. NEW CONCEPTS IN MATERIALS  
HANDLING  
Rhodes, A. W., Ayers, E. D.

*Industrial and Engineering Chemistry*,  
v. 54, pp. 55-56, 58, 60-61, March 1962

- 1,812. INTEGRATED CASTING AND  
ANNEALING; FLASKS AND MOLDS  
ARE HANDLED AUTOMATICALLY  
*Automation*, v. 9, pp. 64-69, March 1962

- 1,813. AUTOMATIC ASSEMBLY OF  
ELECTRICAL EQUIPMENT  
Woodard, S. F.  
*Machinery*, v. 68, pp. 127-130, April 1962

- 1,814. NEW ACTIVATOR GIVES SMOOTH  
BIN FLOW  
*Chemical and Engineering News*, v. 40, p. 61,  
May 14, 1962

- 1,815. MODERN HANDLING TOOL:  
CONTROLLED PLATFORM CARTS  
Bradt, J., Dorrance, J.  
*Automation*, v. 9, pp. 81-85, May 1962

- 1,816. 1962 BUYER'S GUIDE ISSUE: MATERIALS  
HANDLING AND PACKAGING  
*Modern Materials Handling*, v. 17, pp. 1-386,  
May 1962

- 1,817. 1962 TOOLS AND METHODS REPORT:  
PRACTICAL IDEAS TO CUT  
INSTALLATION COSTS  
*Electrical Construction and Maintenance*,  
v. 61, pp. 87-134, July 1962

## EXCAVATING, DREDGING, AND EARTH-MOVING MECHANISMS AND EQUIPMENT

- 1,818. VYBOR PARAMETROV VSKRYSHNYKH EKSKAVATOROV DLYA BESTRANS-  
PORTNYKH SISTEM RAZRABOTKI  
(SELECTION OF PARAMETERS OF  
EXCAVATORS FOR STRIPPING OF  
OVERBURDEN WHEN NO ADDITIONAL  
TRANSPORTATION IS REQUIRED)  
Yumatov, B. P.  
*Gornyi Zhurnal*, v. 132, no. 10, pp. 52-56,  
October 1957

- 1,819. PRINCIPLES OF EARTHMoving WITH  
SCRAPER EQUIPMENT  
Heiple, D. K.  
Society of Automotive Engineers, Inc.,  
New York, N. Y.  
Paper S33, presented at SAE New England  
Section Meeting, November 12, 1957

Factors are presented which result in over-all job efficiency of scraper equipment in the field. Procedures are included for handling maximum loads by means of pusher loading, downhill loading, straddle loading, chain or shuttle loading, and loading to maintain slope. Tandem operation, a double-bucket scraper, and a rubber-tired prime mover are considered.

- 1,820. ROTARY EXCAVATOR  
*The Engineer*, v. 204, p. 916, December 20, 1957

- 1,821. SMALL SCRAPER MOVES MATERIAL  
FAST, ECONOMICALLY  
Lenhart, W. P.  
*Rock Products*, v. 60, no. 12, pp. 78-79, 116,  
December 1957

The use of a drag scraper mounted on rubber and powered by a 50-hp diesel tractor is described. The machine moves overburden material at the rate of 90 to 140  $\text{yd}^3/\text{hr}$ , for a total cost of six to seven cents/ $\text{yd}^3$ . Low power requirements for the scraper result from use of an elevator that is part of the assembly. (*EI*, 1957)

- 1,822. RESEARCH INTO SCOOP-WHEEL  
EXCAVATORS  
Marcelli, V., Janicek, J.  
*Czechoslovak Heavy Industry (Skoda News)*,  
no. 2, pp. 40-47, 1957

Experience and research provide a basis for the development of scoop-wheel units, the K-300 excavator with scoop capacity of 300 l, and the K-800 unit with scoop capacity of 800 l and output of 1540 or 2050  $\text{m}^3/\text{hr}$ . Investigations carried out regarding a K-1000 excavator are described. (*EI*, 1957)

- 1,823. BULLDOZERS AND SCRAPERS IN  
ANTHRACITE STRIPPING  
Hughes, H. H.  
*Mining Congress Journal*, v. 44, pp. 35-37,  
January 1958

- 1,824. PLOW SPEEDS LINE OVER ROUGH  
TERRAIN  
Reilly, V. J.  
*Electrical World*, v. 149, p. 82, February 17, 1958

- 1,825. RANSOMES AND RAPIER SEVEN CUBIC  
YARD WALKING DRAGLINE  
*The Engineer*, v. 205, pp. 287-290,  
February 21, 1958

- 1,826. WHAT YOU SHOULD KNOW ABOUT  
ATTACHMENTS FOR POWER CRANES  
AND SHOVELS  
*Flow*, v. 13, no. 5, pp. 62-64, 110, February 1958;  
no. 6, pp. 82-84, March 1958

Attachments are selected and used according to the type and weight of material to be moved, depth, clearances, and work volume. Equipment described includes shovels, hoes, clamshell, and dragline buckets. Tables show power shovel hourly output and average equipment life. (*EI*, 1958)

## 1,827. FUNDAMENTALS OF EARTHMOVING

Hunger, R. H.

Society of Automotive Engineers, Inc.,  
New York, N. Y.Paper S84, presented at SAE Meeting,  
Buffalo, N. Y., March 5, 1958

Three basic tools are the bulldozer, scraper, and motor grader. Factors affecting proper selection depending on job conditions are rolling and grade resistance, traction, and altitude. Recent improvements include the Caterpillar No. 8 tractor-mounted ripper having the ability to tear up hard material, and the Gyrodozer which will pry out stumps and rocks and finish-bulldoze smooth surface. (*EI*, 1958)

## 1,828. NEW IDEAS IN SCRAPER LOADING

Imes, V. M.

*Western Construction*, v. 33, no. 3, pp. 35-39,  
March 1958

Field tests on loads and loading times are reported with detail figures. Single pusher effectiveness is evaluated, and cost considerations for big tandem pushers are given. An operating procedure with dual units is described. (*EI*, 1958)

## 1,829. MINING BY USE OF MECHANICAL SCRAPERS

Wooten, J. H.

*American Ceramic Society Bulletin*,  
v. 37, p. 198, April 15, 1958

## 1,830. TRUCK ECONOMICS IN EARTHMOVING

Kress, R. H.

Society of Automotive Engineers, Inc.,  
New York, N. Y.Paper S75, presented at SAE 9th Earth Moving  
Industry Conference, Peoria, Ill.,  
April 15-16, 1958

Types of operation where trucks seem to be most applicable are discussed. Advantages and limitations of scrapers, shovels and rear dump trucks are cited. Reference is made to a LeTourneau-Westinghouse 32-ton rear dump truck. A short wheelbase of 129 in. permits a turning circle of 43 ft., which is close to a similar capacity scraper. A "Hydrair" suspension unit is considered. (*EI*, 1958)

## 1,831. EXCAVATOR ECONOMICS IN

EARTHMOVING

Martinson, F. O.

Society of Automotive Engineers, Inc.,  
New York, N. Y.Paper S72, presented at SAE 9th Earth Moving  
Industry Conference, Peoria, Ill.,  
April 15-16, 1958

Factors applying to selection are stated. Methods for digging and loading include use of power cranes and shovels, self-loading scrapers, front and tractor loaders, bulldozers, graders and trenching machines. An efficiency factor is evaluated and basic factors in operating cost analysis are given. The greatest cost element can be a fixed cost consisting of depreciation, interest and property tax.

## 1,832. TOUGHENING PARTS SUBJECT TO

ABRASION. IMPACT

*Western Metalworking*, v. 16, no. 4, pp. 62-63,  
April 1958

Heat treating of "points" or teeth for excavating equipment to precise requirements is accomplished by four gas fired semi-automatic furnaces at Precision Heat Treating Co., Montebello, Calif. Furnaces are arranged for counter-flow of work. (*EI*, 1958)

## 1,833. IMPROVED BUCKET TEETH CUT COSTS

*Coal Age*, v. 63, no. 6, pp. 114-115, June 1958

Shopmade teeth for dragline buckets, fabricated by submerged arc welding from recently developed alloy steels, show a total life approximately four times that shown in previous tests. The Peabody Coal Company reports considerable savings as a result of this new approach. (*EI*, 1958)

1,834. IMPACT OF MODERN EQUIPMENT ON  
IRRIGATION AND DRAINAGE

Braker, E. A.

*Civil Engineering*, New York, v. 28, no. 7,  
pp. 48-51, July 1958

Details are presented of crawler tractors and matching equipment, digging, hoisting and loading machines, and farm operating and special duty equipment. The clearing of trees, stumps, and stones by crawler tractors variously equipped for rough leveling and smoothing of field and leveling on sloping land is discussed. Water control and conservation, including construction of farm ponds and equipment for construction of flood retarding struc-

tures, are also discussed. The effect of improved equipment on construction prices is considered. (*EI*, 1958)

- 1,835. REEL WITH KNIFE-EDGE BLADES PROVIDES ROTARY LOADING ACTION  
*Machine Design*, v. 30, pp. 108-109,  
August 7, 1958

This device is used with excavating machinery.

- 1,836. APPLYING TODAY'S RIPPER TO JOB  
Evans, R. D.  
Society of Automotive Engineers, Inc.,  
New York, N. Y.  
Paper 70B, presented at SAE National West Coast Meeting, Los Angeles, Calif.,  
August 11-14, 1958

The problem of ripping is to provide fragmentation or size reduction of mass so that resulting material can be rehandled or loaded. The basic equipment design and features required taking into account the function of clevis, types of shanks, and points. A table listing rippable and nonrippable materials is given. Transportation methods, recommended procedure for ripping rock, and cost and performance comparisons are also included. (*EI*, 1958)

- 1,837. CRAWLER-MOUNTED DRAGLINE DOES A DREDGING JOB  
*Pit and Quarry*, v. 51, p. 140, August 1958

- 1,838. DRAGLINE EXCAVATORS  
Caw, J. M.  
*Mine and Quarry Engineering*, v. 24, no. 9,  
pp. 398-406, September 1958;  
v. 25, no. 4, pp. 170-181, April 1959

General factors concerning earthmoving equipment are discussed. Design features and applications of dragline excavators are considered, as well as advantages and disadvantages of dragline. The design and application of power shovels, including face shovels, skimmers and cranes, are presented. (*EI*, 1959)

- 1,839. ELECTRIC DRAGLINE FOR SOFT GROUND  
*The Engineer*, v. 206, no. 5362, pp. 696-697,  
October 31, 1958

Long crawler track design mounting is considered which was developed by Ruston-Bucyrus, Ltd., for use on 150-RB draglines required for operation on soft ground, such as is encountered in open cast mining. Electric drive and control equipment are also discussed. (*EI*, 1958)

- 1,840. COMPUTER DETERMINES MAXIMUM PAYLOADS FOR CRANES AND EXCAVATORS  
Peyrot, J. B., Knudsen, H., Richards, L. M.  
*SAE Journal*, v. 66, pp. 36-38, October 1958

- 1,841. LA ROUE-PELLE (BUCKET EXCAVATOR)  
Linden, G.  
*Construction*, v. 13, no. 10, pp. 312-318,  
October 1958; no. 11, pp. 338-344,  
November 1958

A bucket excavator and its applications are discussed. A shovel designed for continuous operation is described which incorporates only a small number of buckets, whose only job is to excavate. Unloading is carried out by means of conveyor belts. Various uses for earthmoving, quarrying, etc., are discussed. (*EI*, 1958)

- 1,842. PUBLIC WORKS EXHIBITION  
*The Engineer*, v. 206, no. 5363, pp. 717-720,  
November 7, 1958; no. 5364, pp. 770-774,  
November 14, 1958

An illustrated review of some of the exhibits shown at Olympia in the London exhibition opening November 10, 1958, is presented, with special reference to earthmoving machinery, loaders and tractor mounted equipment, concrete mixers, crawler tractors, scrapers, shovels, road machinery, etc. (*EI*, 1958)

- 1,843. PUBLIC WORKS AND MUNICIPAL SERVICES CONGRESS AND EXHIBITION  
*Roads and Road Construction*, v. 36, no. 431,  
pp. 332-351, November 1958

A report is given on an exhibition at Olympia, November 10-15, 1958, featuring road machinery, trucks and trailers, portable compressors, crushers and grinders, pneumatic tools, tractors, crawler tractors, dump trucks, pumps, bulldozers, materials handling equipment, and mixers.

1,844. METHODS OF REMOTELY REMOVING  
THE BED FROM A SAND FILTER

Thornburg, C. O.

December 3, 1958

Oak Ridge National Laboratory, Tenn.

ORNL-2613, W-7405-eng-26

(Also available through U.S. Dept. of  
Commerce, Office of Technical Services,  
Washington, D. C.)

Methods of remotely removing a sand bed from an isolated sand radiochemical filter were developed and tested, including a water eductor method, a pressurized vessel method, and a steam jet method. The last method appeared most reliable and practical, and special attention was given to determining optimum conditions for bed removal using a steam jet. (NSA, 1959, #2737)

1,845. SPECIAL BUCKET DIGS TOWER  
GRILLAGE PITS

*Electrical World*, v. 150, p. 88,

December 22, 1958

1,846. STRUCK AND HEAPED CAPACITY OF  
CARRYING-TYPE SCRAPERS

McGuire, J. G.

*Pit and Quarry*, v. 51, pp. 122-123,

December 1958

1,847. NEW TYPE OF UNIVERSAL SHOVEL  
EXCAVATOR OF CZECHOSLOVAK MAKE

Soukop, V., Samotny, R.

*Czechoslovak Heavy Industry*, no. 11, pp. 15-22,  
1958

The D-051 Universal Shovel Excavator serves for loosening and loading of materials by means of one excavating vessel on the caterpillar undercarriage. The principal unit of the machine is a face shovel of 0.5-m<sup>3</sup> capacity. A kinematic schematic diagram of the D-051 excavator is given, as well as an explanation of the pneumatic control and characteristic parameters of the excavator.

1,848. ZEMLESOSNYE SNARYADY SPETSIAL—  
NOGO NAZNACHENIYA (EARTHMOVING  
MACHINES FOR SPECIAL PURPOSES)

Shkundin, B. M.

*Gidrotehnicheskoe Stroitelstvo*, v. 28, no. 1,  
pp. 42-50, January 1959

A suction method for construction of the Salekhard dam in frozen ground is described. A choice between four different machines is given, one of which is an earth-sucking machine for Kama-Vychegda and Vychegda-Pechora canals. Characteristics of machinery are presented. Machines are discussed for the Nizhne-Kamsk hydroelectric power plant. (EI, 1959)

1,849. RIPPER AND SCRAPERS EAT AWAY  
107-FT ROCKY CUT

*Roads and Streets*, v. 102, pp. 98-100, 102,  
March 1959

1,850. EVOLUTION OF SCRAPER

Isgren, E.

Society of Automotive Engineers, Inc.,  
New York, N. Y.

Paper S184, presented at SAE Central Illinois  
Section Meeting, April 15, 1959

An illustrated description is given of development of scraper design during the past 90 years.

1,851. OFTEN SEEN, SELDOM UNDERSTOOD  
BULLDOZER

Wilson, E. M.

Society of Automotive Engineers, Inc.,  
New York, N. Y.

Paper S182, presented at SAE Central Illinois  
Section Meeting, April 15, 1959

Several types of bulldozers and their use are described. The type of loads and the amount and type of material to put in the blade, which have to be considered by the designer, are discussed. (EI, 1959)

1,852. BETRACHTUNGEN UEBER DAS  
PROBLEM DES GRABWIDERSTANDES  
AN GEWINNUNGSGERAETEN IM  
TAGEBAU (CONSIDERATION OF  
PROBLEM OF RESISTANCE TO DIGGING  
BY EARTHMOVING MACHINES IN  
OPEN PITS)

Bahr, J.

*Freiberger Forschungshefte*, no. 117, pp. 115-132,  
June 1959

A method of calculating forces involved in digging and cutting soil and friable rock is described. (EI, 1961)

- 1,853. DIE ENTWICKLUNG IM BAGGERBAU IN DER UdSSR WAEHREND DER LETZTEN FUENF JAHRE (DEVELOPMENT IN CONSTRUCTION OF EXCAVATORS IN SOVIET UNION DURING THE LAST FIVE YEARS)  
Dombrowski, N. G.  
*Freiberger Forschungshefte*, no. 117, pp. 133-139, June 1959

The construction of excavators with bucket capacities ranging up to 35 m<sup>3</sup> is discussed. (*EI*, 1961)

- 1,854. EQUIPMENT MAINTENANCE GUIDE  
*Construction Methods and Equipment*, v. 41, no. 7, 55 pages between p. 88 and p. 206, July 1959

Maintenance programs and recommendations are presented by fifteen service experts on the following subjects: crawler tractors, motor graders, scrapers, rollers, compressors, trenchers, portable crushers, shovels and cranes, off-highway trucks, asphalt mixers, pavers, tractor shovels, rock drills, air tools, and wheel tractors. Tables are given of comparative specifications for crawler tractors, motor graders, tractor drawn scrapers, self-propelled scrapers, steel rollers, pneumatic tired rollers, and compressors. (*EI*, 1959)

- 1,855. POMIARY OPOROW SKRAWANIA GRUNTOW I WEGLA BRUNATNEGO W KOPARKACH WIELOCZERPAKOWYCH KOTOWYCH (MEASUREMENTS OF RESISTANCE OF SOIL AND LIGNITE TO CUTTING BY SCOOP WHEEL EXCAVATOR)  
Brach, I.  
*Przeglad Mechaniczny*, v. 18, no. 15, pp. 487-490, August 10, 1959

This method of measurement is applied to selection of the most efficient design of excavator. (*EI*, 1959)

- 1,856. PERFORMANCE AND DESIGN OF MODERN TRACTOR-MOUNTED RIPPERS  
Fahnstock, C. R., Larson, D. J.  
Society of Automotive Engineers, Inc., New York, N. Y.  
Paper 907, presented at SAE National Farm Construction and Industrial Machinery Meeting and Display, Milwaukee, Wis., September 14-17, 1959

(See also *SAE Journal*, v. 67, no. 12, pp. 58-60, December 1959)

A discussion is presented of the application, economics and future of the heavy duty tractor ripper which makes it possible to rip and scraper-load materials that formerly had to be drilled and blasted. Comparison is made of ripping and blasting methods in relation to utilization of equipment available. End use of material, and method of transporting it are covered. Important design factors in performance are the following: type of linkage, selection of design load, ripping angle and depth, point design, and properly matched hydraulic components. (*EI*, 1959)

- 1,857. ELECTRIC DRIVES FOR EXCAVATORS  
Gatliff, P. W. R.  
*English Electric Journal*, v. 16, no. 3, pp. 23-31, September 1959

Generators, motors, and control equipment installed in a series of Ruston-Bucyrus 150 RB-type excavators are described. Details on the control scheme and auxiliary drives are given. (*EI*, 1959)

- 1,858. VERSATILE TRACTOR WITH DIGGER AND SHOVEL  
*Engineering*, v. 188, p. 390, October 23, 1959

- 1,859. WHEELED LOADING SHOVELS  
*The Engineer*, v. 208, p. 650, November 20, 1959

- 1,860. LA PELLE-GRUE HYDRAULIQUE AUTOMOTRICE FRANCAISE POCLAIN T.Y. 300 (FRENCH HYDRAULIC AUTOMOTIVE SHOVEL CRANE)  
POCLAIN TY 300  
*Mines et Metallurgie*, no. 3534, pp. 671-673, November 1959

The capacity of this shovel is 300 l. The self-propelling type weighs 8500 kg and its highest speed is 15 km/hr. The shovel may be replaced by a bucket or grab bucket. Characteristics of a two-cycle diesel engine and hydraulic mechanism are described. (*EI*, 1960)

- 1,861. SHALE EXCAVATION METHODS AT INTERNATIONAL AIRPORT, WASHINGTON  
*Roads and Streets*, v. 102, pp. 54-56, 108-110, 112, December 1959

1,862. SOME PROBLEMS IN DESIGN OF CRAWLER TRACTORS

Little, L. F.

*Institution of Mechanical Engineers, Proceedings of the Automobile Division*, no. 7, pp. 193-214, 1959-1960

Problems encountered in the design of tractors used in the earthmoving industry are discussed, in particular those associated with performance and those which arise when attempting to improve life and reliability under arduous operating conditions. Of factors affecting durability, the most difficult to contend with is that of shock loads in suspension and transmission resulting from ground conditions and high rotational inertia of transmission train. Future trends of development are conjectured. (*EI*, 1961)

1,863. ORINOCO SCRAPER SPEEDS STOCKPILE FEED

Hubbell, C. H.

*Engineering and Mining Journal*, v. 161, no. 1, pp. 85-87, January 1960

At Puerto Ordaz, Venezuela, a mobile ore bridge with the conveyor belt feeding from the crushing section blends ore and feeds onto a  $1.3 \times 10^6$  metric ton storage pile. The scraper, hung from rail mounted towers, scoops ore into tunnels where it is conveyed to ore ships. (*EI*, 1960)

1,864. TWO NEW LOADING SHOVELS

*Mechanical Handling*, v. 47, no. 1, pp. 33-36, January 1960

Specifications for Loadmaster 1000 and 3000 are given. Model 1000 has  $1\frac{1}{2}$  yd<sup>3</sup> scoop capacity, a flexibly mounted four-cylinder, four-stroke diesel engine, direct fuel injection, and a pressurized lubrication system. Model 3000 has a six-cylinder, four-stroke diesel engine, rigidly mounted with full power shift in each direction.

1,865. TANDEM SCRAPERS; NEW-OLD COMPETITIVE TOOL

*Roads and Streets*, v. 103, pp. 76-78, 81, February 1960

1,866. ROTATING BLADES SCRAPE OFF STICKY CONTENTS IN NEWLY DESIGNED BOTTOM-DUMP ORE CAR

*Machine Design*, v. 32, pp. 128-129, March 3, 1960

1,867. CRANE-SHOVEL INDUSTRY ADOPTS NEW RATING METHOD

*Steel*, v. 146, p. 102, March 7, 1960

1,868. ERFAHRUNGEN MIT GERAETEN FUER DEN ERDBAUBETRIEB (EXPERIENCE WITH EARTHMOVING EQUIPMENT)

Schmidlein, K.

*Verein Deutscher Ingenieure Zeitschrift*, v. 102, no. 9, pp. 333-338, March 21, 1960

A description is given of the design and performance of a universal excavator with 134-ft jib, bucket-wheel excavators of open-bottom type with a theoretical capacity of 380 yd<sup>3</sup>/hr, crawler-mounted loading equipment, and four- and six-wheel 20- and 30-ton trucks. (*EI*, 1960)

1,869. TOWER EXCAVATOR DIGS WATERWAY CHANNEL

*Excavating Engineer*, v. 54, no. 3, pp. 32-33, March 1960

The excavation assembly used at Jackson lock and dam near Coffeeville, Alabama, comprises a main or "head" tower about 140 ft high, mounted on four crawler-type trucks, another shorter "tail" tower mounted on a similar tracklaying base, and a cable suspended between them. A dragging bucket, rolling on the cable, is capable of moving 12 yd of earth 800 ft in a single maneuver. (*EI*, 1960)

1,870. WHEELED TRAXCAVATOR MAKES BOW

*Roads and Streets*, v. 103, pp. 165-166, March 1960

1,871. WHICH WHEEL-TYPE LOADER FOR YOU?

*Roads and Streets*, v. 103, pp. 116, 118, 134, March 1960

1,872. MALOINERTSIONNYI ELEKTROPRIVOD EKSKAVATOROV (LOW-INERTIA ELECTRIC DRIVE FOR EXCAVATORS)

Kraitsberg, M. I., Kaminskaya, D. A., Lomakin, V. P.

*Elektrichestvo*, v. 80, no. 4, pp. 26-30, April 1960

In a generator-motor drive system with dynamoelectric control, incorporating continuous voltage and current feedbacks with cutoff and stabilizing transformer, provi-

sion is made for two-stage extinction of the generator magnetic field when the command controller is set in zero position. Additional resistance is connected in a series with generator excitation winding, in order to reduce the electromagnetic time constant of the generator. (EI, 1961)

- 1,873. ISSLEDOVANIE RABOTY ELEKTRO-  
PRIVODA EKSKAVATORA EVG-15 NA  
ELEKTRONNOI MODELI (ELECTRONIC  
COMPUTER STUDY OF MOTOR DRIVE  
IN EVG-15 TYPE EXCAVATOR)  
Vasilev, V. G., Kondratenko, A. I.,  
Lomakin, V. P., Tarasova, N. Ya.  
*Elektrichestvo*, v. 80, no. 6, pp. 39-41, June 1960

The dynamic operating condition of electric equipment is verified. Optimum parameters of stabilizing links and certain static characteristics of rotary, hoist, and thrust drives are established. (EI, 1961)

- 1,874. HUGE MACHINES MINE CONTINUOUSLY  
*Engineering and Mining Journal*, v. 161,  
no. 6, pp. 218-219, June 1960

A bucket wheel excavator, built by Orenstein-Koppel and Lubecker Maschinenbau Aktiengesellschaft (LMG), has a total service weight of 6790 tons and can excavate up to 10,500 m<sup>3</sup>/hr. The excavator's value lies in stripping the overburden of excavating soft materials such as coal, loose ores, borax, soft iron-ores, and phosphate. (EI, 1960)

- 1,875. NOWE METODY OBLICZANIA OPOROW  
SKRAWANIA GRUNTOW W MASZYNACH  
DO ROBOT ZIEMNYCH (NEW METHODS  
OF CALCULATING RESISTANCE OF  
SOIL TO CUTTING BY EARTHMOVING  
MACHINES)  
Brach, I.  
*Przeglad Mechaniczny*, v. 19, no. 13, pp. 377-380,  
July 10, 1960

Dependence of cutting soil on angle at which blade is installed is discussed as well as the rate of cutting, depth of cutting, and, in part, width of segment of soil removed during cutting. (EI, 1961)

- 1,876. SIMPLE CHAIN SCRAPER FOR DRY  
DUST COLLECTORS  
Stewart, A. J.  
*Chemical Engineering*, v. 67, p. 154,  
July 11, 1960

- 1,877. AIR-CONTROLLED CRANE-EXCAVATOR  
*Engineering News-Record*, v. 165, p. 51,  
July 28, 1960

- 1,878. O SISTEMAKH UPRAVLENIYA PRIVODAMI  
EKSKAVATOROV SREDNEI MOSHCHNOSTI  
(CONTROL SYSTEMS FOR DRIVES OF  
MEDIUM-SIZED EXCAVATORS)  
Kraitsberg, M. I., Kaminskaya, D. A.,  
Lomakin, V. P.  
*Elektrichestvo*, v. 80, no. 7, pp. 30-35, July 1960

Comparison is made between drive systems for excavator shovels (capacity 6 to 8 m<sup>3</sup>) using dynamoelectric amplifiers jointly with intermediate magnetic amplifiers and dynamoelectric amplifiers by themselves. While the latter is favored, it is recommended that external flexible feedbacks be excluded. (EI, 1961)

- 1,879. MODERN COMPACTION TECHNIQUES—  
FOUNDATIONS OF EARTHMOVING  
Seaman, H. J.  
*Roads and Engineering Construction*, v. 98,  
no. 7, pp. 62-65, July 1960

A lift method is considered by which dirt is moved onto a fill area and compacted before the next lift is placed. A progressive method in which pulverizing is done by hauling, dumping, dozing and grading equipment is also examined. When followed immediately by compaction, the equipment method requires less compaction time. Methods of sand compaction and types of equipment are given. (EI, 1961)

- 1,880. NEW HYDRAULIC EXCAVATOR  
*Hydraulic Power Transmission*, v. 6, no. 67,  
pp. 448-453, 469, July 1960

A description is given of a new JCB.4 hydraulic excavator developed by J. C. Bamford (Excavators), Ltd., which embodies many new design features. A multi-purpose bucket performs functions of face shovel, square holer, etc. (EI, 1960)

- 1,881. LeTOURNEAU-WESTINGHOUSE PACES  
MARKET WITH NEW EQUIPMENT AND  
SPECIAL ATTACHMENTS  
*Automotive Industries*, v. 123, no. 4, pp. 72-73,  
August 15, 1960

The flexibility of L-W equipment is extended by marketing attachments of other manufacturers, e.g., prime

mover "V-Power B Tournapull," powered by a General Motors two-stroke, 12-cylinder diesel at 430 hp at 2100 rpm. The following attachments and equipment are mentioned: tandem scrapers, available behind three "Tournapulls," and the four-wheel "Speedpull," self-loading scraper; an automatic "all transistor" control for maintaining the proper degree of transverse blade slope; a ripper to rip asphalt pavement to a 12-in. depth; a coal handling blade; etc. (EI, 1960)

**1,882. DRAGLINES PACE FLEXIBLE THIN-SEAM STRIPPING**

*Coal Age*, v. 65, pp. 88-90, August 1960

**1,883. MORE THAN ONE WAY TO DIG A DITCH**

*Excavating Engineer*, v. 54, no. 8, pp. 9-14, August 1960

Excavation is reported of total 14.3 mi long St. Francis River channels of 130 ft bottom width, 1:3 side slopes, and varying depths. Two medium size draglines and one hydraulic dredge were used by one contractor and only two large walker-draglines by another; excavation work involves  $1.7 \times 10^7$  yd<sup>3</sup> of earth. Excavating and dredging operations and equipment used are detailed. (EI, 1961)

**1,884. HYDRAULIC EXCAVATOR AND SHOVEL**

*The Engineer*, v. 210, p. 508, September 23, 1960

**1,885. WELDED WHEEL EXCAVATOR MOVES EARTH FAR AND FAST**

Young, O.  
*Welding Engineer*, v. 45, no. 9, pp. 34-35, September 1960

A 1500-ton wheel excavator was fabricated predominantly by welding, by the Bucyrus-Erie Company. Two types of steel used were high strength, low alloy Tri-Ten steel for superstructure, and mild steel. Manual ac metal arc welding was employed in more than 80% of both shop and field welding operations with E7018 low-hydrogen, iron powder, all-position electrodes. (EI, 1960)

**1,886. BUCKET WHEELS IN GERMANY**

*Mining Engineering*, v. 12, pp. 1013-1016, September 1960

**1,887. DREDGING IN NAVAL PORTS**

Vickars, B. J.  
*Dock and Harbour Authority*, v. 41, no. 480, pp. 187-192, October 1960

There are four major naval ports in the United Kingdom and three abroad where maintenance dredging in varying quantities is a continual commitment. The craft employed include bucket dredgers, self-propelled and dump grab dredgers, and self-propelled hoppers. Their design and operation and the use of cathodic protection are reviewed. Information is included on dredging and reclamation problems. (EI, 1961)

**1,888. BUCKET WHEEL IS VERSATILE EXCAVATOR**

*Engineering and Mining Journal*, v. 161, p. 104, October 1960

**1,889. TEST ON DYNAMIC MECHANICAL PERFORMANCE OF POWER SHOVEL**

Abe, T.

*J.S.M.E. (Japan Society of Mechanical Engineers) Bulletin*, v. 3, no. 12, pp. 580-587, November 1960

As impact loads of power shovels vary according to digging conditions and operating method, and as impact loads are difficult to understand theoretically, analysis was made of oscillogram recordings taken on various factors concerning power shovels doing actual work. The degree of impact torque applied on the power shovel during digging, swing, and traveling was considered, as well as the reduction of impact and improvement of working properties by attachment of a fluid power transmission device. (EI, 1961)

**1,890. INSTALLATION POUR L'EXTRACTION ET LE LAVAGE DU SABLE  
(INSTALLATION FOR DREDGING AND WASHING OF SAND)**

Mozzi, G. M.

*Construction*, v. 15, no. 11, pp. 415-418, November 1960

A description is given of 160-tph capacity special dredge used on the Po River in Italy, with facilities for removing up to 30% impurities. It comprises various screens and tanks for decanting, and facilities for pumping and discharge of washing water. A 45-hp diesel motor is used for all functions. (EI, 1961)

**1,891. BRITISH VERSION OF "TROJAN" TRACTOR SHOVEL**

Mumby, K.

*Mechanical Handling*, v. 47, no. 11, pp. 729-736, November 1960

Development is discussed of an earthmover having a lifting capacity of 12,000-lb, a 105-hp diesel engine, automatic transmission and torque converter, and a 2-yd<sup>3</sup> general utility bucket. The major feature is an arm design in which all moving parts are enclosed by welded box section casing; double acting hydraulic lift rams operate horizontally, and their thrust is exerted in a line that is almost parallel with that of tractive force. (EI, 1961)

- 1,892. BIG SHOVEL PROVES IMPORTANCE OF DESIGN  
*Steel*, v. 147, pp. 70-71, December 26, 1960

- 1,893. SAND PUMPING DREDGER "TAURUS"  
*Shipbuilding and Shipping Record*, v. 96, no. 26, p. 835, December 29, 1960

Taurus is owned by Danish Waterways Hydraulic Engineering Department and was constructed by Frederikshavn Dockyard Co. for service on Graadyb Bar at the entrance to Esbjerg Harbor. Its over-all length was 255' 11"; breadth molded 42' 8"; depth 19' 8". The five-cylinder Burmeister & Wain engine develops 2780 brake horsepower. Special swivel couplings facilitate operation of two 35½-in.-bore suction pipes with below waterline suction depth of 65' 7". (EI, 1961)

- 1,894. BULLDOZERS AS A SUPPLEMENTAL TOOL TO STRIPPING SHOVELS AND DRAGLINES  
Cooper, C. J.  
*Mining Congress Journal*, v. 46, pp. 43-47, December 1960

- 1,895. HOW TO FIGURE YOUR BEST SCRAPER LOADING TIME  
Peurifoy, R. L.  
*Roads and Streets*, v. 103, pp. 49, 74, December 1960

- 1,896. SPECIAL CUTTING EDGES HELP MOVE GUMBO IN GEORGIA  
*Roads and Streets*, v. 103, pp. 65-66, December 1960

- 1,897. EXPERIMENTAL INVESTIGATIONS OF LOOSE BODIES, FROM ASPECT OF THEORY OF STOCHASTIC MEDIUM  
Bodziony, J., Smolarski, A. Z.

*Academie Polonaise des Sciences, Bulletin de l', Series des Sciences Techniques*, v. 8, no. 3, pp. 139-144, 1960

An apparatus is described which was built for experimental verification of J. Litwiniszyn's theory of stochastic media to explain the development of subsidence troughs under the influence of excavation. Experiments with sand indicate that the postulate of linearity is valid only in a certain narrow range of conditions. (EI, 1961)

- 1,898. BEITRAG ZUR THEORIE DES SCHAUFELRADES (CONTRIBUTION TO THEORY OF BUCKET WHEELS)  
Pajer, G.  
*Wissenschaftliche Zeitschrift der Magdeburg Hochschule fuer Schwermaschinenbau*, v. 4, no. 1, pp. 123-134, 1960

Shortcomings of the theory of bucket wheel excavators and problems of resistance to cut and lifting of dredged material by bucket wheel are discussed. (EI, 1960)

- 1,899. HIGH PRESSURE HYDRAULICS FOR EARTH MOVING VEHICLES  
Garney, C. F.  
Society of Automotive Engineers, Inc., New York, N. Y.  
Paper S284, presented at SAE Central Illinois Section Meeting, Chicago, Ill., January 23, 1961

A study is presented of fluid characteristics under high pressure which may affect the system design, particularly where design pressures may be as high as 6000 psi. Physical characteristics which are subject to change as a result of high-pressure operation of the hydraulic system are viscosity and compressibility. Operating and maintenance factors, the leakage factor and a leakage control program are detailed. Characteristics of fire-resistant fluids of a straight synthetic type, water-glycol, and an inverse phase emulsion type are pointed out. (EI, 1961)

- 1,900. ELEKTROPRIVOD LEBEDOK NOSOVYKH KANATOV DRAGI (MOTOR DRIVE FOR WINCHES OF FORE CABLES OF DREDGE)  
Burgin, B. Sh.  
*Elektrichestvo*, v. 81, no. 1, pp. 30-34, January 1961

Analysis is presented of forces and speeds of a winch in order to establish requirements for drive. (EI, 1961)

**1,901. NEW WAYS TO USE MOTOR GRADER**  
Gahbauer, S. F.

*Engineering and Contract Record*, v. 74, no. 1,  
pp. 70-75, January 1961

This paper describes eight available grader models. Only about one third of all graders in the United States are contractor owned; the other two thirds belong to cities, municipal bodies, and highway authorities. Grader working time is calculated in advance. Attachments for graders are described. (*EI*, 1961)

**1,902. GRAB DREDGER FROM GAINSBOROUGH**  
*Shipbuilding and Shipping Record*, v. 97, no. 5,  
p. 151, February 2, 1961

Dredger M.C.B. 1 (N) was delivered by Gainsborough, Ltd., to the British Waterways repair depot at Goole. The vessel, 61 ft long, with beam of 15 ft and depth of 5 ft, is of all welded steel construction, and is powered by a Lister Blackstone air cooled diesel engine of 30 hp. (*EI*, 1961)

**1,903. TWO SCRAPER TRACTORS FEATURE TORQUE DIVIDER TRANSMISSION**  
*Engineering News-Record*, v. 166, p. 75,  
February 2, 1961

**1,904. PAYLOAD AND PERFORMANCE WITH ALUMINUM**  
Weltman, W. C., Jr.  
Society of Automotive Engineers, Inc.,  
New York, N. Y.  
Paper S287, presented at SAE Meeting, Chicago,  
Ill., February 15, 1961

Various examples relating to earthmoving equipment, off-highway equipment hauling ore, rock salt, coal, etc., are given to prove the basic economic advantage of light-weight aluminum equipment. Heat treated, strain hardened and casting alloys are tabulated, with application and characteristics given. (*EI*, 1961)

**1,905. LATEST DREDGING PRACTICE**  
Erickson, O. P.  
*American Society of Civil Engineers,*  
*Proceedings of the, Journal of the Waterways*  
*and Harbors Division*, v. 87, no. WW1,  
paper 2729, pp. 15-28, February 1961

A description is given of improvements incorporated in a modern hydraulic dredge; the trend is to higher and

higher horsepower on the main pump and cutter. All lined dredge pumps and pump and shutter shafts are of high alloy steel; larger diameter dredge spuds are of structural or cast-alloy steel; and dredge cutters are made with removable wear edges. Universal use of anchor handling booms is discussed together with a direct suction pipe-cutter drive, and pontoon line ball joints that eliminate usual bolted connections. (*EI*, 1961)

**1,906. PROJEKT NOVOGO ZEMLESOSNOGO SNARYADA DLYA GIDROTEKHNICHEKOGO STROITELSTVA (DESIGN OF NEW SUCTION DREDGE FOR HYDRAULIC CONSTRUCTION)**  
Shkundin, B. M.  
*Gidrotekhnicheskoe Stroitelstvo*, v. 31, no. 2,  
pp. 8-13, February 1961

An electrical dredging engine is described for hard ground, with working depths of 15-18 m. Drawings are presented and a design of a special drill-cutter for adhesive ground is included. (*EI*, 1961)

**1,907. NEW SHOVEL BOOSTS STRIPPING CAPACITY AT GREEN COAL CO.**  
*Coal Age*, v. 66, pp. 76-80, February 1961

**1,908. POWER SHIFTED WHEEL TRACTOR-SCRAPERS ANNOUNCED BY CATERPILLAR TRACTOR CO.**  
*Roads and Streets*, v. 104, pp. 150-151,  
February 1961

**1,909. EARTHMOVING: MOSTLY ABOUT SCRAPERS**  
Park, K. F.  
*Roads and Streets*, v. 104, pp. 74-75, 78-79,  
82-83, 86, March 1961; pp. 94, 96, 112, April 1961;  
pp. 67-70, May 1961; pp. 98, 102-103, June 1961

**1,910. TODD BUILDS MODERN HYDRAULIC DREDGE**  
*Marine Engineering/Log*, v. 66, pp. 55-56,  
March 1961

**1,911. TRACTOR-SCRAPER PERFORMANCE EVALUATION USING DIGITAL COMPUTER**  
Lewis, D. A., Morgan, W. C.

Society of Automotive Engineers, Inc.,  
New York, N. Y.  
Paper S297, presented at SAE Central Illinois  
Section Meeting, April 4-7, 1961

Techniques employed by Caterpillar Tractor Company in simulating performance of tractor-scraper vehicles are discussed. The quantity used as the primary evaluation yardstick is cost/yd of moving earth; the problem of calculating the combined cost/yd of hauling and pushing units is presented. An earthmoving cycle was adopted for calculation. Performance was simulated for a tractor-scraper on various portions of an earthmoving cycle, and the time required for a vehicle to traverse each was calculated. (*EI*, 1961)

- 1,912. PROMYSHLENNYE ISPYTANIYA  
ROTORNOGO EKSKAVATORA DLYA  
DOBYCHI OGNEUPORNYKH GLIN  
(TESTING OF ROTARY EXCAVATOR FOR  
MINING REFRACTORY CLAYS)  
Kuznetsov, V. A., Volodarskii, Z. V., Bro, S. M.  
*Gornyi Zhurnal*, v. 137, no. 4, pp. 47-49,  
April 1961

The PKTI-type excavator has a capacity of 25 m<sup>3</sup>/hr. The wheel is equipped with eight buckets, each having a volume of 80 l. The maximum angle of slope over which the excavator is able to move is 20 deg. The excavator weighs 56.3 tons. (*EI*, 1961)

- 1,913. WEIGHT-USEFULNESS RELATIONSHIPS  
FOR STRIPPING MACHINES  
Rumfelt, H.  
*Coal Age*, v. 66, no. 4, pp. 79-83, 85, April 1961

- 1,914. GARDENMASTER 85 ROTARY  
CULTIVATOR  
*Engineering*, v. 191, pp. 670-672, May 12, 1961

- 1,915. GIANT SPLINES FOR A GIANT SHOVEL  
*American Machinist/Metalworking  
Manufacturing*, v. 105, p. 148, May 15, 1961

- 1,916. RIPPING POINTS—USE AND  
MAINTENANCE  
Dils, E. W., Jr.  
*Western Construction*, v. 36, no. 5, pp. 88, 90,  
92, May 1961

The development history and the use of various tractor-mounted hydraulic rippers are discussed. Proper use of various ripping points, such as bucketed and dipper points used on boots, modified bucket and dipper points used directly on shanks, and points designed specifically for ripping, is described. (*EI*, 1961)

- 1,917. EARTHMOVING INDUSTRY CONFERENCE  
[PEORIA, ILLINOIS, APRIL 4-5, 1961]  
*Roads and Streets*, v. 104, pp. 55, 128, May 1961

- 1,918. DRAG-SUCTION DREDGER "KAIRYU  
MARU"  
*Shipbuilding and Shipping Record*, v. 97, no. 25,  
pp. 803-804, June 22, 1961  
(See also *Motor Ship*, v. 42, no. 490, pp. 86-87,  
May 1961)

Screws and twin rudders are features of a trailing-type dredger built by Yokohama Shipyard & Engine Works of Mitsubishi Nippon Heavy-Industries, Ltd., for the Japanese Ministry of Transportation for service in Nagoya harbor.

- 1,919. SPECIAL SHOVEL BREAKS THIN-SEAM  
LOADING BOTTLENECK  
*Coal Age*, v. 66, pp. 106-108, May 1961

- 1,920. TIEBACKS REMOVE CLUTTER IN  
EXCAVATION  
*Engineering News-Record*, v. 166, no. 23,  
pp. 34-36, June 8, 1961

Use of prestressed tiebacks in various building constructions to secure soldier beams in excavations is described. Tiebacks are safe; they make bracings unnecessary and provide unobstructed working space within the excavation. Details are given of installing tiebacks, grout-anchoring of tendons in rock sockets, and prestressing of tendons of tiebacks by hydraulic jacks. (*EI*, 1961)

- 1,921. APPLICATION AND PERFORMANCE OF  
WHEEL EXCAVATORS  
Rumfelt, H.  
*Mining Congress Journal*, v. 47, no. 6, pp. 46-49,  
June 1961

Differences in mechanical construction, operation, and application between two types of excavators are discussed.

- 1,922. SCRAPER DRAGS SCALE FROM MILL:  
 $\frac{1}{2}$ -YD DRAG-SCRAPER SYSTEM AT  
 INLAND STEEL CO.'S EAST CHICAGO  
 PLANT  
*Iron Age*, v. 188, p. 74, August 24, 1961

- 1,923. PORTABLE BARGE THAT WENT WEST  
*Rivers and Harbors*, v. 46, no. 8, p. 22,  
 August 1961  
 (See also *Shipbuilding and Shipping Record*,  
 v. 98, no. 13, p. 411, September 28, 1961)

The portable dredge, Sandstorm, built by the American Machine & Engineering Company and owned by the Missouri Valley Construction Company can be transported to a dredging site by ship, rail, or truck; it is  $65 \times 24 \times 6$  ft, and in six sections bolted together with watertight connections. At the Grand Island, Nebraska, project, dredged material will be pumped a distance of 4000 ft. A 16-in. dredge pump is driven by a 12-cylinder General Motors engine rated at 1230 hp. (EI, 1961)

- 1,924. RUSTON-BUCYRUS 22-RB EXCAVATOR  
*Engineering*, v. 192, pp. 218-220, August 1961

- 1,925. IS CREATIVE DESIGN BEING SHACKLED  
 BY PRODUCTION INERTIA?  
 Timberlake, T. G.  
 Society of Automotive Engineers, Inc.,  
 New York, N. Y.  
 Paper 399A, presented at SAE National Heavy  
 Duty Vehicle Meeting and Display,  
 Milwaukee, Wis., September 11-14, 1961

This study was made to formulate data which could be used in programming and planning earthmoving equipment developments conducted by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va. Developments studied were grouped into product redesign, product engineering, and developmental engineering. Sixteen equipment classifications are tabulated which represent the combat essential earthmoving equipment development spectrum. (EI, 1961)

- 1,926. HYDROSTATIC DRIVE REPLACES  
 ENGINE: GRADALL EARTHMOVER  
 Brownfield, K.  
*Hydraulics and Pneumatics*, v. 14, pp. 91-92,  
 September 1961

- 1,927. COMPONENT DESIGNS FOR SHOVEL'S  
 CLUTCH SYSTEM  
 Chalupsky, P. A.  
*Hydraulics and Pneumatics*, v. 14, pp. 107-109,  
 September 1961

- 1,928. SOIL COMPACTOR ON SLOUGH BY-PASS  
*Engineering*, v. 192, p. 476, October 13, 1961

- 1,929. SCRAPER LOADED TRAIN DRIVING  
 LONG EXPLORATION CROSSCUTS  
 AT COCHENOUR WILLANS GOLD  
 MINES LIMITED  
 Delaney, J. F.  
*Canadian Mining and Metallurgical Bulletin*,  
 v. 54, pp. 777-782, October 1961

- 1,930. L'ENTRETIEN DES RIVIÈRES ET  
 L'AMÉNAGEMENT DES VALLÉES  
 (THE MAINTENANCE OF THE RIVERS  
 AND THE GRADING OF THE VALLEYS)  
 Duminy, A.  
*Travaux*, v. 45, no. 324, pp. 813-817,  
 October 1961

A new suction dredge for maintenance of small rivers is adaptable to requirements. Boat-mounted German-made equipment has a capacity of  $20 \text{ m}^3/\text{hr}$ . The boat is 6.50 m long and 2.20 m wide. A cutting head on a 3.50-m long boom is driven from the boat by an air-cooled diesel engine. The head takes in loosened material by suction and pumps it through pipes of required length to shore. (EI, 1961)

- 1,931. HYDRAULIC EXCAVATOR: J.C.B.3  
*The Engineer*, v. 212, p. 754, November 3, 1961

- 1,932. SAND SUCTION VESSEL "PETERSTON"  
*Shipbuilding and Shipping Record*, v. 98, no. 19,  
 pp. 605-606, November 9, 1961

Sand is drawn into the vessel by a 20-in.-D steel pipe, which is lowered over the ship's side by radial and crescent type davits in conjunction with electric winches.

- 1,933. "AFAN," DIESEL-ELECTRIC HOPPER  
 DREDGER  
*Shipbuilding and Shipping Record*, v. 98, no. 23,  
 pp. 735-737, December 7, 1961

A twin screw, twin suction hopper vessel is described. Propulsion motors, spoil pumps, all sluice valves, hopper

doors, and raising and lowering of suction trailer pipes are operated and controlled from the wheelhouse.

1,934. TWIN-SCREW, DIESEL-ELECTRIC DREDGER "MERSEY COMPASS"

*Shipbuilding and Shipping Record*, v. 98, no. 24, pp. 770-772, December 14, 1961

A self-loading, grab hopper vessel of 2200-ton capacity is described.

1,935. DITCHING DRAGLINE WAS THE SCRAPERS' BEST FRIEND

Cummings, J. R.

*Roads and Streets*, v. 104, pp. 52-55, December 1961

1,936. SMALLER TRACTORS AND SCRAPERS SHARE GLORY ON CANYON JOB

*Roads and Streets*, v. 104, pp. 42-44, December 1961

1,937. O DWOCH MODELACH ROZKŁADU NAPREZEN W PROCESIE SKRAWANIA GRUNTÓW W MASZYNACH DO ROBOT ZIEMNYCH (TWO SYSTEMS OF STRESS DISTRIBUTION IN PROCESS OF GROUND CUTTING WITH EARTH WORKING MACHINES)

Brach, I.

*Archiwum Budowy Maszyn*, v. 8, no. 2, pp. 193-200, 1961 (in Polish with English summary)

A system determining cutting resistance by means of Gologurski formulas is faulty; a new model of stress distribution is presented and compared with the former. It is shown that at angles exceeding 60 deg, cutting resistance does not increase or increases in an insignificant way. (*EI*, 1961)

1,938. RADIO-CONTROLLED TRACTOR 'DOZES DANGEROUS JOBS

*Machine Design*, v. 34, p. 12, January 4, 1962

1,939. RENDSBURG ROAD TUNNEL

*The Engineer*, v. 213, pp. 110-111, January 12, 1962

1,940. U-BLADE DOZER SPEEDS REFUSE HANDLING

Bronow, J. A.

*Public Works*, v. 93, pp. 82-83, January 1962

1,941. GLACIAL BOG REMOVED BY ROLLING SURCHARGE AND TANDEM THROWING

*Roads and Streets*, v. 105, pp. 64-66, January 1962

1,942. TWELVE-MILE SHOVEL MOVE WITH PORTABLE POWER

*Coal Age*, v. 67, pp. 86-87, January 1962

1,943. RX FOR SCRAPERS: NORTH, SOUTH, EAST, WEST

Park, K. F.

*Roads and Streets*, v. 105, pp. 31+, February 1962; pp. 52-53+, March 1962; pp. 56-58+, May 1962

1,944. REDESIGN IMPROVES TRACTOR SHOVEL; NEW MODEL 114 TROJAN TRACTOR SHOVEL

Orwig, H. L.

*Automotive Industries*, v. 126, pp. 50-51, 76, 77, February 1, 1962

1,945. CAT BRINGS OUT NEW LINE OF SCRAPERS

*Engineering News-Record*, v. 168, pp. 40-44, March 1, 1962

1,946. CATERPILLAR'S NEW SCRAPER LINE HAS CAPACITIES FROM 30 TO 54 CU YD

*Engineering and Mining Journal*, v. 163, p. 47, March 1962

1,947. NINE NEW SCRAPERS FEATURED IN BROAD NEW LINE

*Coal Age*, v. 67, p. 118, March 1962

1,948. PRODUCT ENGINEERING THIRD ANNUAL MASTER DESIGN AWARDS; MINING AND EXCAVATING MACHINE

*Product Engineering*, v. 33, p. 101, April 16, 1962

- 1,949. SCRAPER DIRT STAYED WET,  
EXCAVATORS TAKE OVER  
Cummings, J. R.

*Roads and Streets*, v. 105, pp. 82-85+,  
April 1962

A highway relocation job is undertaken.

- 1,950. BUCKET SCRAPER INSTALLATION  
IMPORTANT PROCESSING PHASE  
*Pit and Quarry*, v. 54, p. 104, May 1962

- 1,951. STEEP CLIMBING TWIN-ENGINE  
SCRAPERS LEVEL MOUNTAININSIDE LOTS  
*Roads and Streets*, v. 105, pp. 46-48, May 1962

- 1,952. BOTTOM-DUMPS AND TANDEM  
SCRAPERS SHARED LONG URBAN  
HAULS

Glidden, H. K.

*Roads and Streets*, v. 105, pp. 56-59, June 1962

- 1,953. DREDGE-DRAGSCRAPER-CONVEYOR  
COMBINATION SOLVES SAND AND  
GRAVEL PRODUCER'S PROBLEM  
*Pit and Quarry*, v. 54, pp. 125-126, June 1962

- 1,954. NEW RATING SYSTEM GAUGES TIRE  
WORK, REDUCES TIRE FAILURE IN  
SCRAPER OPERATIONS  
*Pit and Quarry*, v. 54, p. 67, June 1962

- 1,955. CRANE OPERATOR TEASES ROCKS  
FROM HIGH REACHES  
*Roads and Streets*, v. 105, pp. 110-111,  
October 1962

## EARTH DRILLING MECHANISMS AND EQUIPMENT

### 1,956. STANOK OGNEVOGO BURENIYA

(JET DRILLING RIG)

Yagupov, A. V.

*Gornyi Zhurnal*, v. 135, no. 5, pp. 5-10, May 1959

Design and testing of a rig for drilling in quarries attaining a depth of 17 m are described. The rate of penetration of a 160-mm-D jet burner ranges from 1.8 to 13.9 m/hr. The design of a three-jet burner and casing head is presented. (*EI*, 1961)

### 1,957. TERMICHESKOE BURENIE SHPUROV DIYA VTORICHNOGO VZRYVANIYA V KARERE (THERMAL DRILLING OF SHOT HOLES FOR SECONDARY BLASTING IN QUARRY)

Brichkin, A. V., Akhmetov, M. M.,

Syundyukov, U. M.

*Gornyi Zhurnal*, v. 135, no. 8, pp. 37-38,

August 1959

A 23-mm-D portable jet drill is described which has a penetration capacity of 20 to 33 m/hr in microquartzites, or 35 holes/hr. (*EI*, 1961)

### 1,958. INITIAL EXPERIMENTS IN LONG-HOLE DRILLING IN STOPES AT WELKOM GOLD MINING CO., LTD.

MacIver, D. E.

In "Association of Mine Managers of South Africa—Papers and Discussions 1958-1959," pp. 555-562

Association of Mine Managers of South Africa,  
Johannesburg, 1960

Drilling holes in excess of 20 ft in the stopes of a mine at Welkom Gold Mining Co. is discussed. The holes have been drilled with a 3½-in. screw-feed bar-rigged machine, using jointed rods of 1¼-in.-OD in 5-ft lengths. Tungsten carbide cruciform detachable bits, in sets of three, were used. (*EI*, 1961)

### 1,959. PORTABLE DRILL RIG FOR PRODUCING SHORT ORIENTED CORES

Graham, K. W., Keiller, J. A.

*Geological Society of South Africa, Transactions and Proceedings of the*, v. 63, pp. 71-73,  
January-December 1960

Construction and operation of a light, portable drill rig and orienting instrument used to produce oriented cores to a depth of 3 ft are described. (*EI*, 1961)

### 1,960. SLIM HOLE DRILLING AND TUBINGLESS COMPLETIONS IN OKLAHOMA

Spiller, H.

In "Proceedings of the Advanced Petroleum Engineering Seminar, February 9-10, 1960," pp. 29-43

University of Oklahoma, Norman, 1960

Development and application of slim-hole drilling are discussed. Comparison is made of conventional and slim-hole drilling operations and costs under various conditions. (*EI*, 1961)

### 1,961. EFFEKTIVNOST BURENIYA SHPUROV ELEKTROSVERLAMI PRI PROVEDENII GORNORAZVEDOCHNYKH VYRABOTOK (EFFICIENCY OF DRILLING SHOTHOLES USING ELECTRIC DRILLS DURING DRIVING OF EXPLORATORY WORKINGS)

Rudavskii, I. E.

*Razvedka i Okhrana Nedr*, v. 26, no. 3, pp. 23-27,  
March 1960

Performance of drills in various rocks is described. (*EI*, 1961)

### 1,962. MERY BORBY S AVARIYAMI PRI BURENII V USLOVIYAKH MNOCOLETNEI MERZLOTY (METHODS OF PREVENTING FAILURES DURING DRILLING UNDER PERMAFROST CONDITIONS)

Vasilev, A. N.

*Razvedka i Okhrana Nedr*, v. 26, no. 4, pp. 27-30,  
April 1960

The most frequent failures are due to freezing, rupture of drilling strings, and collapse of borehole walls. Remedies for each type of failure are recommended. (*EI*, 1961)

- 1,963. PRIMENENIE ELEKTRONNYKH MODELIRUYUSHCHIKH USTANOVOK DIYA RASCHETA OPTIMALNYKH PARAMETROV PROTSESSA BURENIYA (USE OF ELECTRONIC MODELS OF INSTALLATIONS FOR CALCULATING OPTIMUM PARAMETERS OF DRILLING PROCESS)  
Ashavskii, A. M., Litvinov, N. N.  
*Razvedka i Okhrana Nedr*, v. 26, no. 5, pp. 22-26, May 1960

An electronic model of a bottom-hole vibrational-rotary device is described which is being constructed as part of mechanization of exploratory drilling. (*EI*, 1961)

- 1,964. BURENIE PODZEMNYKH SKVAZHIN KOLONKOVMY I RUCHNYMI ELEKTROSVERLAMI (DRILLING OF UNDERGROUND BOREHOLES USING CORE DRILL AND MANUAL ELECTRIC DRILLS)  
Kalinin, F. I.  
*Razvedka i Okhrana Nedr*, v. 26, no. 5, pp. 26-29, May 1960

Types of equipment are recommended for mining use in deposits with complicated tectonic structure.

- 1,965. OPYT PRIMENENIYA ZABOINYKH VIBRATOROV PRI LIKVIDATSII AVARII NA GLUBOKIKH RAZVEDOCHNYKH SKVAZHINAKH TRESTA KRIVBAS-AGEOLOGIYA (EXPERIENCE WITH APPLICATION OF BOTTOM HOLE VIBRATORS FOR PREVENTION OF FAILURES IN DEEP EXPLORATORY BORE HOLES OF KRIVBASAGEOLOGIYA TRUST)  
Pitade, A. A.  
*Razvedka i Okhrana Nedr*, v. 26, no. 5, pp. 45-46, May 1960

Prevention of wedging of bits in deflected boreholes in iron deposits of Krivoi Rog is discussed. (*EI*, 1961)

- 1,966. FLOATING VESSEL DRILLING AND MULTICOMPLETION METHOD  
Guinn, D. C., Walker, R. W.  
American Society of Mechanical Engineers, New York, N.Y.  
Paper 60-SA-39, presented at ASME Summer Annual Meeting, Dallas, Texas, June 5-9, 1960

A method of drilling and completion of an oil well from a floating vessel, permitting ocean floor installation of well head equipment, is shown to be completely feasible. Experimental work is described, and economics, drilling and completion procedures, and well testing are considered. (*EI*, 1961)

- 1,967. AVTOMATICHESKOE UPRAVLENIE PROTSESSOM TURBINNOGO BURENIYA PRI POMOSHCHI SAMONA STRAIVAYUSH-CHIKHSYA SISTEM (AUTOMATIC CONTROL OF TURBINE DRILLING PROCESS BY MEANS OF ADAPTIVE SYSTEMS)  
Eskin, M. G.  
*Avtomatika i Telemekhanika*, v. 21, no. 6, pp. 791-805, June 1960  
(See also English translation in *Automation and Remote Control*, v. 21, no. 6, pp. 552-562, December 1960)

Devices are discussed for choosing optimal parameter ratios under changes in external conditions of turbine drilling. One device uses a semiautomatic control scheme. (*EI*, 1961)

- 1,968. O ZABOINYKH AVTOMATAKH VRASHCHATEL NOGO BURENIYA (BOTTOM HOLE AUTOMATION OF ROTARY DRILLING)  
Minin, A. A.  
*Neftyanoe khozyaistvo*, v. 38, no. 6, pp. 30-33, June 1960

Methods of regulating the load on a turbodrill and problems of constructing an automatic device for control of bit performance are presented. (*EI*, 1961)

- 1,969. PRIMENENIE ISKRIVLENNYKH SEKTSIONNYKH TURBOBUROV-PUT K UVELICHENIYU SKOROSTEI BURENIYA GLUBOKIKH NAKLONNYKH SKVAZHIN (USE OF DEFLECTING SECTIONAL TURBODRILL AS MEANS OF INCREASING RATES OF DRILLING DEEP SLANT HOLES)  
Movsumov, A. A., Karasik, G. E.  
*Neftyanoe khozyaistvo*, v. 38, no. 6, pp. 36-40, June 1960

The advantages of turbodrill deflection by  $1^{\circ}30'$  to  $2^{\circ}$  as experienced in Azerbaijan are discussed. Details of deflecting arrangement are given. (*EI*, 1961)

- 1,970. RASPREDELLENIE USILII V DETALYAKH TURBOBOURA (DISTRIBUTION OF STRESSES IN TURBODRILL PARTS)  
Melikgaikazova, N. I.  
*Neftyanoe Khozyaistvo*, v. 38, no. 6, pp. 41-45,  
June 1960

An analysis of longitudinal stress acting on a turbodrill during its performance is presented. The influence of stresses on monolithic character of rotor and stator of the turbodrill is considered. (*EI*, 1961)

- 1,971. BURENIE SHPUROV KOLTSEVYMI KORONKAMI (SHOT HOLES DRILLING USING CORING BITS)  
Katin, K. P.  
*Razvedka i Okhrana Nedr*, v. 26, no. 7, pp. 25-29,  
July 1960

The use of 40-mm-D coring bits increases penetration 1.8 to 1.9 and the efficiency of work 1.5 times, as compared to that of conventional chisel-shaped drills. (*EI*, 1961)

- 1,972. BUROVOI STANOK BMP-110 (DRILLING RIG BMP-110)  
Pervukhin, P. I.  
*Gornyi Zhurnal*, v. 136, no. 7, pp. 56-57,  
July 1960

A pneumatic drill designed to drill vertical and inclined shotholes of 105 to 115 mm in diameter to depths of 30 m is described. (*EI*, 1961)

- 1,973. OB AVTOMATIZATSII PODACHI DOLOTA PRI TURBINNOM BURENII (AUTOMATIC FEED OFF BIT DURING TURBINE DRILLING)  
Kengerlinskii, Yu. S., Fuks, V. L.  
*Neftyanoe Khozyaistvo*, v. 38, no. 7, pp. 33-38,  
July 1960

Results of a study of the degree of precision in measuring the load on a bit by different devices are presented, and control for directional slant hole drilling is discussed. (*EI*, 1961)

- 1,974. AERATSIYA GLINISTYKH RASTVOROV SSB PRI BURENII SKVAZHIN V POGLOSHCHAYUSHCHIKH GORIZON-

- TAKH (AERATION OF ROTARY MUD CONTAINING SULPHITE DISTILLERY GRAIN ADDITIVE DURING DRILLING IN THIEF ZONE)  
Strukov, F. I.  
*Neftyanoe Khozyaistvo*, v. 38, no. 7, pp. 50-52,  
July 1960

- 1,975. DRILLING EXPERIMENTS BY P111 4 ROTARY DRILLING MACHINE  
Kinoshita, S.  
*Mining and Metallurgical Institute of Japan, Journal of the*, v. 76, no. 866, pp. 537-542,  
August 1960

Drilling tests were carried out in shale and sandstone using a rotary drilling machine with a two-winged bit. If more than 200 to 300 kg of thrust is applied to the rod, drilling speed can be extended to over 120 to 150 cm/min. An empirical formula illustrating thrust speed characteristics in practical rotary drilling performance is presented. (*EI*, 1961)

- 1,976. NOVOE V ELEKTROBURENII (NEW DEVELOPMENT IN ELECTRIC DRILLING)  
Fomenko, F. N.  
*Neftyanoe Khozyaistvo*, v. 38, no. 9, pp. 26-31,  
September 1960

Development of the electric drill since 1956 has shown increased reliability of electric equipment, increased power of the drill, reduction of the drill diameter, and improvement of the conductor supplying the electric power to the drill. (*EI*, 1961)

- 1,977. MALOGABARITNOE BURENIE I MODELIROVANIE ETOGO PROTSESSA (SMALL DIAMETER DRILLING AND MODELS OF PROCESS)  
Kiriya, T. A.  
*Neftyanoe Khozyaistvo*, v. 38, no. 9, pp. 32-36,  
September 1960

A model used as an aid in design of small diameter turbines is found to be inadequate. Conditions are outlined which allow an effective design of turbodrill turbines. (*EI*, 1961)

- 1,978. O SOOTNOSHENII ENERGETICHESKIKH PARAMETROV, KHARAKTERIZUYU-SHCHIKH PROTSESS RAZRUSHENIYA GORNOI PORODY (INTERRELATION OF ENERGY PARAMETERS WHICH CHARACTERIZE PROCESS OF ROCK DESTRUCTION DURING DRILLING)  
Simonov, V. V., Potapov, F. Yu.  
*Neftyanoe Khozyaistvo*, v. 38, no. 9, pp. 36-39, September 1960

Conditions under which the performance of turbodrill bits will attain the highest efficiency are outlined. The most efficient bit penetration is calculated. (EI, 1961)

- 1,979. RATSIONALNYE REZHIMY I TIPY DOLOT PRI BESKERNOVOM RAZVEDOCHNOM BURENII (RATIONAL PROCESSES OF DRILLING AND BIT TYPES USED IN FULL-HOLE DRILLING)  
Mershalov, A. F., Yakovlev, V. I.  
*Razvedka i Okhrana Nedr*, v. 26, no. 9, pp. 26-31, September 1960

The article considers drilling in argillites, siltstones, sandstones, conglomerate, boulders, and silicified limestones. The advantages of full-hole drilling are presented. (EI, 1961)

- 1,980. ANALIZ REZULTATOV RABOTY TVERDOSPLAVNYKH BUROVYKH NAKONECHNIKOV I EFFEKTIVNOST IKH PRIMENENIYA (ANALYSIS OF PERFORMANCE RESULTS OF HARD ALLOY BITS AND EFFICIENCY OF THEIR USE)  
Volodchenko, K. G., Guberman, D. M., Mostinskii, T. I.  
*Razvedka i Okhrana Nedr*, v. 26, no. 9, pp. 31-33, September 1960

Statistical data on penetration rates of eight bit types in seven types of rocks are presented. (EI, 1961)

- 1,981. TRUCK MOUNTED ROTARY BLAST-HOLE DRILLING AT INSPIRATION  
Anderson, T. M.  
In "Proceedings of the Symposium on Surface Mining Practices, October 1960," pp. 43-47  
Arizona, University of, College of Mines, Tucson

A Reich Model T-750 drill, capable of drilling a 9-in. hole, is equipped with a separate power unit, compressors, a hydraulic-controlled mast, hydraulic pumps for rotary drive, pull down and leveling jacks, and a hydraulically driven water pump for dust control. The drill is scheduled to operate only one shift per day, and can "knock-down," move from one pit to another (an average distance of 2.5 mi), and set up in 30 min. (EI, 1961)

- 1,982. OPYT PRIMENENIYA TURBOBUROV SO SHTYREVYMI DOLOTAMI DLYA PROKHODKI RAZVEDOCHNYKH SKVAZHIN V TVERDYKH PORODAKH (EXPERIENCE WITH USE OF TURBO-DRILLS WITH THREE CONE BITS FOR DRILLING EXPLORATORY BOREHOLES IN SOLID ROCK)  
Pitade, A. A.  
*Razvedka i Okhrana Nedr*, v. 26, no. 10, pp. 20-24, October 1960

Data on drilling in hard Lake Superior-type iron ores are given. (EI, 1961)

- 1,983. NEW 8-IN. AIR HAMMERS CUT DRILLING COSTS IN BIG HOLES  
Eckel, J. E., Murray, S. D., Van Meter, B. M., Liljestrand, W. E.  
*Oil and Gas Journal*, v. 58, no. 45, pp. 125-128, November 7, 1960

Field tests of a new 8-in. hammer drill prove that it can extend percussive air and gas drilling to hole sizes as large as 13 $\frac{3}{4}$  in. An 8-in. hammer drill, with 170-lb hammer, strikes a blow of 337 ft/lb, when operating at a 275-psi pressure drop. Field tests, drilling rates, and hammer performance are reported. (EI, 1961)

- 1,984. SURVEYING DEEP BOREHOLES  
*Mining and Chemical Engineering Review*, v. 53, no. 2, p. 69, November 15, 1960

An electronic instrument, containing an RF oscillator, measures deviations of boreholes by recording, at the surface, changes in frequency produced by tilting of the instrument. The difference between instrument frequency and frequency of the reference oscillator on the surface is measured and recorded on a dial calibrated in degrees of deviation. (EI, 1961)

1,985. DER SCHLAGABLAUF IN KOLBEN UND STANGE BEIM SCHLAGENDEN BOHREN (IMPACT IN PISTON AND ROD DRIVING PERCUSSIVE DRILLING)

Arndt, F. K.

*Glueckauf*, v. 96, no. 24, pp. 1516-1524,  
November 19, 1960

The problem is considered from the point of view of elastic theory of impact. Piston expansion, measurement of impact duration, rebound as the result of impact, and the difference between impact impulse and impact energy are discussed. The relation between the rate of drilling, the required feeding power, and the striking impact is detailed. (*EI*, 1961)

1,986. MOON PRESENTS UNIQUE PROBLEMS FOR DRILLERS

*Oil and Gas Journal*, v. 58, no. 47, pp. 255, 257,  
November 21, 1960

A lunar drilling system to be rocketed into space by an unmanned spaceship is described. The system is designed to collect samples of the Moon's surface for analysis by X-ray diffraction. Results of the analysis will then be radioed back to Earth. (*EI*, 1961)

1,987. NEW ELECTRIC RIG IS COMPACT, PORTABLE, FLEXIBLE—FOR ROCKY MOUNTAIN DRILLING

Mayer, F. R.

*Oil and Gas Journal*, v. 58, no. 48, pp. 60-63,  
November 28, 1960

A converted diesel-electric unit by Exeter Drilling Co. improves efficiency through greater portability, faster rigup and teardown, increased drilling rate, and lower maintenance cost. Portability of the 900-hp medium-depth jet-bit drilling rig was improved by compacting the equipment into a minimum number of easily handled units. (*EI*, 1961)

1,988. PRACTICAL LOOK AT SLIM-HOLE DRILLING

Aggers, B. A.

*Petroleum Engineer*, v. 32, no. 12, pp. B34-36, 38,  
November 1960

The design and operation of slim-hole drilling are described and costs and penetration rates discussed. Proper

development is possible if the programmed well depth is not beyond the range of available equipment, if formations to be penetrated are not too hard, if no serious hole deviations are expected, and if protective casing strings are not required. (*EI*, 1961)

1,989. AUTOMATED HYDRAULIC RIG FOR FASTER DEEP DRILLING

Fanshawe, H. D.

*World Petroleum*, v. 31, no. 12, pp. 53-54, 98,  
November 1960

Basic features of the British rig are (1) the selective use of automation to replace men, as the operations are too fast for manual intervention, and (2) the use of mechanisms on moving platforms which are unsafe for man. This approach reduces the rig size and crew, yet allows a round trip from 16,000 ft in under three hours. The rig is considered uneconomic in drilling shallower than 10,000 ft. Savings can be expected to exceed 15%. (*EI*, 1961)

1,990. DESIGN AND APPLICATION OF TURBO-DRILL

Harrington, A. T.

*Canadian Mining and Metallurgical Bulletin*,  
v. 53, no. 583, pp. 857-865, November 1960

The design, operation, and limitations of a rotary drill and a turbodrill are discussed. The causes of crooked drill holes are considered. Drilling problems and advantages of turbodrill are pointed out. The latter include its ability to drill straight holes, greater facility, and safety to workmen. (*EI*, 1961)

1,991. HOW TO INCREASE BIT WEIGHT FOR LESS COST

Keliner, J. M., Roberts, A. P.

*World Oil*, v. 151, no. 6, pp. 131-133, 135,  
November 1960

To obtain high bit weight near the surface and reduce tripping time at depth, a new, lightweight, high-output force applicator, called a hydraulic wall-anchored drill collar, was developed. Using this tool, surface holes can be drilled more economically where the use of sufficient bit weight is prevented by limitations of drill collar length. Drill collar handling time is reduced. (*EI*, 1961)

- 1,992. UNIQUE WIRELINE WORKOVER  
CONVERTS DUAL TO TRIPLE WELL  
Rohe, G. S., Porter, W. L.  
*World Oil*, v. 151, no. 6, pp. 115-118,  
November 1960

Using wireline techniques and a pressure actuated jet perforator, a two-string dual completion was converted to a triple producer. A gun was run in the hole set on the bottom opposite the zone to be perforated and wireline tools were removed. After additional wireline work was completed, hydrostatic pressure was increased to fire the gun. (EI, 1961)

1,993. ALUMINUM DRILL PIPE PASSES  
FIRST TEST

McGhee, E.  
*Oil and Gas Journal*, v. 58, no. 50, pp. 102-104,  
December 12, 1960

For the first time aluminum drill pipe was used to drill a 10,400-ft hole. No definite conclusions regarding the advantages over steel pipe were reached. The pipe showed no damage from normal handling with slips, tongs, and elevators; no apparent damage from corrosion or pitting was noted. Pump pressures with the aluminum pipe were not quite as high as with 4½-in. steel pipe. (EI, 1961)

1,994. DRILL-COLLAR STABILIZERS DO WORK  
IN SOFT SHALES

Pearson, R. G.  
*Oil and Gas Journal*, v. 58, no. 51, pp. 96-98,  
December 19, 1960

Drill-collar stabilizers can be used to good effect in softer shales. Such formations apparently do not enlarge at a fast rate and, as a result, furnish a near-gage hole on which stabilizers can bear in helping to keep the hole straighter. This conclusion results from over-lapping caliper surveys made through southern Oklahoma's Springer shale. (EI, 1961)

1,995. NEW PIPE CONFIGURATION REDUCES  
WALL STICKING

Fox, F. K.  
*World Oil*, v. 151, no. 7, pp. 83-87,  
December 1960

Differential sticking is unbalanced hydrostatic pressure which exists when there is a differential of unequalized hydraulic pressure across a pipe. This phenomenon will

result in an unbalanced pressure condition causing the pipe to be held against the wall of the borehole. Wall-sticking may be prevented by keeping the pipe in motion, controlling the condition of drilling fluid by use of centralizers-stabilizers, and by changing the design of the drilling string. (EI, 1961)

- 1,996. GIDRAVLICHESKIE ZABOINYE  
MAKHANIZMY I PORODORAZRUSHAYU-  
SHCHII INSTRUMENT DLYA BURENIYA  
UDARNO-VRASHCHATELNYM SPOSOBOM  
(HYDRAULIC BOTTOM HOLE MECH-  
ANISMS AND ROCK CRUSHING  
INSTRUMENT FOR DRILLING BY  
PERCUSSION-ROTARY METHOD)  
Graf, L. E.  
*Razvedka i Okhrana Nedr*, v. 26, no. 12,  
pp. 18-23, December 1960

Experiments conducted in the laboratory and in the field indicate the possibility of increasing the rate of drilling 5 to 6 times. The types of bits used are discussed. (EI, 1961)

1,997. O PRIMENENII STRUINYKH DOLOT V  
TURBINNOM BURENII (USE OF JET  
BITS IN TURBINE DRILLING)

Barshai, G. S., Bulakh, G. I., Gusman, M. T.  
*Neftyanoe Khozyaistvo*, v. 29, no. 1, pp. 8-13,  
January 1961

The design of a turbodrill is described with emphasis on the fast removal of cuttings at depths reaching 2500 m, and pressure generated by a pump equal to 150 kg/cm<sup>2</sup>. Drilling deep wells, using a turbodrill with jet bits, requires the manufacture of a pump creating a head of 250-300 kg/cm<sup>2</sup>. (EI, 1961)

1,998. BASIC VARIABLES IN ROTARY DRILLING  
Fish, B. G.

*Mine and Quarry Engineering*, v. 27, no. 1,  
pp. 29-34, January 1961; no. 2, pp. 74-81,  
February 1961

Basic relationships are presented for rotary drilling in the light of extensive research studies of the process. The variables involved are classified, and thrust, torque, and penetration rate relationships investigated. (January)

A drilling mechanism is described with particular reference to rotation speed, effect of rock type, and "drill ability." (February) (EI, 1961)

- 1,999. USTANOVKA DLYA AKUSTICHESKIKH ISSLEDOVANII V BUROVYKH SKVAZHINAKH (INSTALLATION FOR ACOUSTICAL INVESTIGATIONS IN BOREHOLES)  
Khalevin, N. I., Barykin, D. D.  
*Akademika Nauk SSSR, Izvestiya, Seriya Geofizicheskaya*, v. 24, no. 1, pp. 69-79,  
January 1961

A station has been designed to record the intensity alteration of dominating harmonic elastic waves in boreholes, which may be used in seismic logging of average velocities. Examples are given of records taken in the boreholes. (*EI*, 1961)

- 2,000. TILT YOUR DRILL—IMPROVE EFFICIENCY  
Kochanowsky, B. J.  
*Rock Products*, v. 64, no. 1, pp. 109-112,  
January 1961

Mathematical calculations, scale-model experiments in the laboratory, and large-scale tests in quarries prove the advantages of the inclined drilling method. It is concluded that savings in drilling and explosives cost are 1% for each degree of hole inclination. In the inclined hole less rock resistance against blasting at the toe of the bench is encountered. (*EI*, 1961)

- 2,001. PORODORAZRUSHAYUSHCHII INSTRUMENT DLYA UDARNO-VRASHCHATELNOGO BURENIYA GIDROUDARNIKOM (ROCK CRUSHING INSTRUMENT FOR ROTARY PERCUSSION DRILLING USING HYDRAULIC PERCUSSION DEVICE)  
Kogan, D. I.  
*Razvedka i Okhrana Nedr*, v. 27, no. 1, pp. 18-23,  
January 1961

Data on drilling shotholes indicate the efficiency of the rotary percussion method of rock drilling. The effect of the rate of circulating medium flow is discussed. Characteristics of hard alloys used as bit inserts are considered. (*EI*, 1961)

- 2,002. NOVYI ZABOINYI MEKHANIZM DLYA PROKHODKI GLUBOKIKH SKVAZHIN (NEW BOTTOM-HOLE MECHANISM FOR DRILLING DEEP BOREHOLES)

Voskresenskii, F. F., Slavskii, Yu. N.  
*Razvedka i Okhrana Nedr*, v. 27, no. 1, pp. 23-26,  
January 1961

Hydraulic rotary percussion drills may be used in boreholes of 60-250 mm in diameter. Data on drilling in different rock types are included. (*EI*, 1961)

- 2,003. LABORATORY DRILLING PERFORMANCE OF FULL-SCALE ROCK BIT  
Rowley, D. S., Howe, R. J., Deily, F. H.  
*Journal of Petroleum Technology*, v. 13, no. 1,  
pp. 71-81, January 1961

Drilling tests with 4½-in. hard formation rock bits were made under rock pressure and borehole fluid pressures simulating a 3000-ft borehole. Effects of bit weight and rotary speed on drilling rate and bit rotary power were determined in hard, impermeable dolomite. Experimental procedure is described and analysis of data presented. Drilling rate in the field, bit rotary power results, drilling effectiveness results, and drilling bit efficiency are all considered. 24 references. (*EI*, 1961)

- 2,004. OPYT PROMYSHIENNODOGO OGNOVOGO BURENIYA VZRYVNYKH SKVAZHIN (EXPERIENCE WITH JET DRILLING OF BLAST-HOLES)  
Yagupov, A. V., Potapov, A. I.  
*Gornyi Zhurnal*, v. 137, no. 1, pp. 42-45,  
January 1961

The drilling of blast-holes in banded iron ores of Krivoi Rog open pits is discussed. The depth of the drilling was 17.5 m; the diameter of the drillhole was 250 mm; and the average rate of drilling was 4 to 7.5 m/hr. Details on the testing of SBO drills are included. (*EI*, 1961)

- 2,005. SMALL PORTABLE AIR DRILL IN ARCTIC FOR STRATIGRAPHIC EXPLORATION  
*Petroleum Engineer*, v. 33, no. 1, pp. B76, 78,  
January 1961

The drill consists of a portable rotary table and separate blower unit. Four men can carry the rotary table. Air is used as a circulating medium in the present application and is provided by a self-powered portable blowing unit. This unit can be dismantled into three pieces, and each piece carried by two men. The unit operates with six men applying body weight, and may be used to drill under permafrost conditions to a depth of 200 feet. (*EI*, 1961)

2,006. DRILLING IN LIBYAN DESERT

*World Oil*, v. 152, no. 1, pp. 80-82, January 1961

Procedures and special problems involved in Libyan desert drilling are discussed. Drilling and completion methods for water wells, borehole and casing programs, and control of sand abrasion are considered. (*EI*, 1961)

2,007. NEW TECHNIQUE INCREASES  
CORE RECOVERY

Knutson, C. F., Sutton, E. W., Cavanaugh, R. J.  
*World Oil*, v. 152, no. 2, pp. 37-40,  
February 1, 1961

A newly developed rubber-sleeve core barrel is consistently recovering 90%, or better, of cored intervals in the unconsolidated Gulf Coast Miocene and Oklahoma basal McLish formations. Recovery of conventional cores heretofore in these zones has ranged from 0 to 20%. Laboratory evaluation is made and data are compared. The rubber-sleeve core barrel facilitates fracture studies. (*EI*, 1961)

2,008. FOAM AGENTS AND FOAM DRILLING

Murray, A. S., Eckel, J. E.  
*Oil and Gas Journal*, v. 59, no. 8, pp. 125-129,  
February 20, 1961

Foam drilling is used to penetrate competent water-bearing formations, and can handle larger flows of formation water than is generally realized. Aeration drilling is used to penetrate less competent formations and to lift large flows of formation water. Chemicals are used to shut off flows from water-bearing formations. Appraisal of foaming agents, foam injection procedure, air volume requirements, and recovery of usable cuttings are considered. (*EI*, 1961)

2,009. GULF COAST DRILLERS WHIP  
WALL-STICKING PROBLEM

McGhee, E.  
*Oil and Gas Journal*, v. 59, no. 9, pp. 100-103,  
February 27, 1961

Preventatives used for wall-sticking on Gulf Coast include: use of light mud weights; use of stabilizers and centralizers, even in straight-hole areas; use of drill collars with a spiral groove cut along the outside diameter, keeping the drill string in continuous motion if there is danger of sticking; and use of muds with wetting agents, keeping water loss lower and filter cakes thinner in muds. (*EI*, 1961)

2,010. O RESONANSNOM RESHIME RABOTY

VIBRATORA PRI LIKVIDATSII AVARII  
V SKVAZHINAKH (RESONANCE REGIME  
OF VIBRATOR PERFORMANCE IN  
ELIMINATION OF SEIZURE IN  
BOREHOLES)

Palyanov, P. E.

*Razvedka i Okhrana Nedr*, v. 27, no. 2, pp. 42-46,  
February 1961

The performance of a vibrator attached at the surface is more efficient when the frequency of the vibrator coincides with that of the drilling string. The vibrator may be used in cases when freezing occurs as deep as 1000 m. (*EI*, 1961)

2,011. PREDOKHRANENIE MELKOALMAZNYKH  
KORONOK OT CHREZMERNOGO IZNOSA  
PRI BURENII (PREVENTION OF  
EXCESSIVE WEAR OF DIAMOND BITS  
DURING DRILLING)

Bochkarev, V. F.

*Razvedka i Okhrana Nedr*, v. 27, no. 2, p. 60,  
February 1961

Two holes drilled in a bit divert part of the circulating liquid carrying abrasive rock particles; thus, erosion occurs in the thicker part of the bit, and better cooling is achieved. (*EI*, 1961)

2,012. LABORATORY STUDIES OF EFFECT OF  
ROTARY SPEED ON ROCK-BIT  
PERFORMANCE AND DRILLING COST

Cunningham, R. A.

In "Drilling and Production Practice," pp. 7-14  
American Petroleum Institute, New York, N.Y.,  
1960

(See also *Oil and Gas Journal*, v. 58, July 11, 1960)

2,013. WATER-SHUTOFF TECHNIQUES IN AIR  
OR GAS DRILLING

Sufall, C. K.

In "Drilling and Petroleum Practice," pp. 74-77  
American Petroleum Institute, New York, N.Y.,  
1960

Less fractured or open permeability offers a better chance for complete water shutoff. Squeeze pressures must be maintained as low as possible to avoid fracturing the water bearing formation. Better shutoffs are attained from materials that gel or set after entering a permeable section. The economics of shutting off water zones is considered. (*EI*, 1961)

**2,014. RESEARCH IN ROCK DRILLING AND TUNNELLING**

Fish, B. G.

*Mining, Electrical and Mechanical Engineer*, v. 41, no. 484, pp. 261-278, February 1961

The use of systematic laboratory studies to determine characteristic thrust/penetration rate curves and bit-wear data is discussed. Orthodox drilling and blasting techniques were investigated. The problems of continuous mechanical rock excavation are detailed with special reference to laboratory studies of cutting and breaking processes involved. (*EI*, 1961)

**2,015. MAXIMUM PERMISSIBLE DOG-LEGS IN ROTARY BOREHOLES**

Lubinski, A.

*Journal of Petroleum Technology*, v. 13, no. 2, pp. 175-194, February 1961

A means is discussed for specifying maximum permissible changes of hole angle to ensure a trouble-free hole, using a minimum amount of survey. Consideration is given to fatigue failures of drill pipe, force on tool joints, fatigue failures of drill collar connections, and beam pumping problems due to dog-legs. (*EI*, 1961)

**2,016. LADDER DRILLING**

*Mine and Quarry Engineering*, v. 27, no. 2, pp. 82-84, February 1961

A ladder rig incorporates a rock drill and retractable pusher-leg combination mounted on a narrow prefabricated steel ladder. Use of the retractable leg facilitates advance and withdrawal of the rock drill along the ladder, and a sliding cradle carries the drill, which moves with leg in horizontal position. The machine requires little attention and one driller can supervise two machines. The rig's operation in driving a hydroelectric Inverawe-tunnel is described. (*EI*, 1961)

**2,017. HOW TO DRILL SLANT HOLE**

Lawrence, C.

*Oil and Gas Journal*, v. 59, no. 10, pp. 109-111, March 6, 1961

Experience in drilling on Los Angeles town-lot areas where drilling is restricted to sound-proof slant drilling from compact drill sites is discussed. The problems of directional drilling include key-seating, removing cuttings, producing drill torque, and, in the case of high-drift-angle wells, keeping the proper weight on the

bottom. Typical well completions and economics of operation from two drill sites are discussed. (*EI*, 1961)

**2,018. GULF HITS 10,000 FT. IN 3.4 DAYS TO SET DRILLING RECORD IN SOUTH LOUISIANA**

Stone, V. D.

*Oil and Gas Journal*, v. 59, no. 13, pp. 82-89, March 27, 1961

Drilling records show the result of a program of reducing rig time and eliminating lost motion. In this new wellhead assembly and hydraulic program, high rotary speeds and bit weight, and low-weight carefully controlled drilling fluids were used. Time studies on drill pipe connections, trip time, and slope tests are presented. (*EI*, 1961)

**2,019. GRANITE TESTS NEW DRILL RIG**

Alfred, R. C.

*Rock Products*, v. 64, no. 3, pp. 81-83, March 1961

Campbell Limestone's granite quarry at Liberty, S. C., purchased a standard drill and converted it to an all-electric rotary compressor drill. Comparative performance data show average penetration (ft/hr) of 2.2 for a churn drill, and 18.3 for an electric drill, with total cost per ton of .0595 and .035, respectively. (*EI*, 1961)

**2,020. WAVE MECHANICS OF PERCUSSIVE DRILLING**

Fairhurst, C.

*Mine and Quarry Engineering*, v. 27, no. 3, pp. 122-130, March 1961; no. 4, pp. 169-178, April 1961; no. 7, pp. 327-328, July 1961

These articles present information on the mechanical process by which energy is transmitted, in percussive drilling of hard rock, from the piston, along the drill rod, and to the rock. The impact of a finite cylindrical piston on a finite cylindrical rod, and the impact of an elastic cylindrical rod by a rigid piston are discussed.

Special consideration is given to energy losses in rod joints, energy transmission through wedge bit, the dissipation of blow energy, and the effect of the rate of application of bit force. Static and dynamic loading experiments are reported.

Theory and results are compared. Matching impedance, or complete transmission of blow energy into rock, is theoretically possible, assuming a linear force-

displacement characteristic, if the blow has a rising exponential form. Assumption of a linear force-displacement characteristic appears to be in reasonable agreement with experimental evidence. (*EI*, 1961)

**2,021. HOW TO USE FOAMING AGENTS IN AIR AND GAS DRILLING**

Goins, W. C., Jr., Magner, H. J.

*World Oil*, v. 152, no. 4, pp. 59-64, March 1961

Foaming agents aid in decreasing borehole pressure, increasing penetration rate in presence of water, preventing balling of cuttings, and in removing cuttings. Effects of fluid column pressure on drilling rate are discussed, as well as types of foam-producing chemical agents. The field use is discussed as well as equipment and air volume requirement. (*EI*, 1961)

**2,022. VLIYANIE DINAMICHESKOGO NAGRУZHENIYA NA RABOTU PYATY TURBOBURA (EFFECT OF DYNAMIC LOAD ON PERFORMANCE OF TURBO-DRILL SUPPORTING ELEMENT)**

Lyubimov, G. A., Lyu, Ch.-Sh.

*Neftyanoe Khozyaistvo*, v. 39, no. 3, pp. 23-28, March 1961

The causes of wear of the supporting element are considered, and the effect of multiple application of the load to the elastic material of the support is studied. (*EI*, 1961)

**2,023. VOZMOZHNYE EKSPRESS-METODY OPREDELENIYA SOPROTIVLYAEMOSTI RAZBURIVANIYU SKALNYKH POROD (POSSIBLE RAPID METHODS OF DETERMINING RESISTANCE OF ROCKS TO DRILLING)**

Stetyukha, E. I.

*Neftyanoe Khozyaistvo*, v. 39, no. 3, pp. 31-34, March 1961

The functional dependence between the resistance of rocks to drilling and the physical constants of rocks is pointed out. The study is based on an analysis of the physical and mechanical properties of 10,000 cores. The laboratory work included determination of rock density, mineralogical density, absolute porosity, and the coefficient of rebound. (*EI*, 1961)

**2,024. CRAELIUS AUTOMATIC CORE ORIENTATOR**

Roxstrom, E.

*Canadian Mining Journal*, v. 82, no. 3, pp. 60-61, March 1961

The Craelius core orientator was designed for use in inclined small-diameter drill holes, and in areas of magnetic disturbances. The device consists of a cylinder containing a number of axial-glide channels, into which pins can be pressed. When the device is used, these pins take up an impression of the configuration at the bottom of the drill holes. The instrument operates in horizontal and upward inclined drill holes. (*EI*, 1961)

**2,025. NOVYE PRISPOSOBLENIYA Dlya GEOLOGORAZVEDOCHNOGO BURENIYA (NEW DEVICES FOR GEOLOGICAL EXPLORATORY DRILLING)**

Samgin, Yu. S.

*Razvedka i Okhrana Nedr*, v. 27, no. 3, pp. 26-31, March 1961

A device for assembling a drilling string is described, and a hydraulic method of taking rock samples in boreholes is explained. (*EI*, 1961)

**2,026. CHROMATES STABILIZE SHALE CONTROL MUDS AT HIGH TEMPERATURES**

Weiss, W. J., Brukner, J. S., Walker, C. O.

*Petroleum Engineer*, v. 33, no. 3, pp. B35-36, 38, 42, 46, 48, March 1961

Anionic chromium compounds, such as sodium chromate and sodium dichromate, make shale control muds less sensitive to high temperatures. Additives proved successful to 350°F. (*EI*, 1961)

**2,027. DRILLING BEGINS ON PROJECT MOHOLE**

*Compressed Air Magazine*, v. 66, no. 3, pp. 11-13, March 1961

An experimental program to test equipment and techniques for use in deep, offshore drilling through the Earth's crust, down into the mantle near Guadalupe Island, is discussed. A description is given of the 260-ft drilling ship equipped with four diesel steering motors mounted at the corners of the ship to maintain stability and position of the ship. Drilling is by standard rotary method, as used on land by the petroleum industry. (*EI*, 1961)

**2,028. HOW TO PREVENT DIFFERENTIAL-PRESSURE STICKING OF DRILL PIPE**

Haden, E. L., Welch, G. R.

*Oil and Gas Journal*, v. 59, no. 14, pp. 214-216, 219, April 3, 1961

(See also *World Oil*, v. 152, no. 6, pp. 101-106, May 1961)

Results of laboratory tests on the relationship between mud properties and wall sticking show that several surface active agents compatible with most mud systems are effective in reducing sticking. Mud type as well as solids concentration determines the severity of sticking. Decreasing the drill-collar filtercake contact area reduces sticking. (*EI*, 1961)

**2,029. OCEAN DRILLING PASSES FIRST TEST**

*Oil and Gas Journal*, v. 59, no. 15, pp. 72-73, April 10, 1961

Successful core drilling in 11,700 ft of water off lower California indicates that similar operations can be used in petroleum exploration and development. Drilling was conducted as a preliminary phase of the Mohole project, which aims at piercing the Earth's crust and going to 15,000 ft below the ocean floor. Results are given of completed drilling, and innovations which are planned are mentioned. (*EI*, 1961)

**2,030. DIESEL-ELECTRIC RIG FOR FAR NORTH DRILLING**

Bullied, R. H.

*Oil and Gas Journal*, v. 59, no. 15, pp. 100-103, April 10, 1961

The winterization of a rig is simplified by using individual permanent housing of all units except the rig floor. Housing for the draw works and the rig floor is made of prefabricated panels. Equipment was chosen and units spaced to emphasize fast moving, rigup, and teardown. Safety features include ground relay, emergency console cutout, motor cutouts, engine safety switch, indicating meters, and emergency stop. (*EI*, 1961)

**2,031. CONCAVE BIT GIVES INCREASED DRILLING SPEED**

*South African Mining and Engineering Journal*, v. 72, no. 3560, p. 945, April 28, 1961

Tests carried out on gold mines in the Witwatersrand area have established that greater drilling speeds can be

achieved with a new tungsten-carbide-tipped drill bit, the cutting edge of which is concave instead of convex. The new concave shape tends to focus stress waves within the cylindrical volume of rock that is being worked on, with this energy being concentrated in the formation of the hole, instead of being fanned out. (*EI*, 1961)

**2,032. OPYT ZAMERA ISKRIVLENIYA SKVAZHIN PRIBOROM FOTOINKLINOMETR SGL (MEASUREMENT OF BOREHOLE DEVIATION USING SGL PHOTO-INCLINOMETER)**

Garmash, V. M., Sorokin, P. S.

*Razvedka i Okhrana Nedr*, v. 27, no. 4, pp. 47-49, April 1961

A remote-control device is described which was designed to measure vertical deviations of boreholes ranging from  $0^{\circ}10'$  to  $90^{\circ}$ , and azimuths ranging from  $0^{\circ}$  to  $360^{\circ}$  in drainage boreholes which intersect the gallery surrounding the ore body in the Lebedi section of the Kursk iron deposits. (*EI*, 1961)

**2,033. HOW TO CATCH BETTER ROTARY CUTTINGS**

Roederer, E. P., Jr., Brundage, H. T.

*World Oil*, v. 152, no. 5, pp. 65-67, April 1961

Clean samples, readily workable for paleontological analysis, can be obtained from rotary holes through the use of a new sample catcher and washer. The sample catcher automatically collects a representation of the entire formation being drilled and continuously washes the drilling mud from the samples. Samples are sacked at 30-ft intervals. (*EI*, 1961)

**2,034. NEW DUAL-WEIGHT DRILL PIPE TURNS IN GOOD PERFORMANCE**

McGhee, E.

*Oil and Gas Journal*, v. 59, no. 18, pp. 98-99, May 1, 1961

This new pipe has thin wall sections through most of its length; however, the last four to six feet on the box end are thicker. The result is that this string of pipe is light but is not subject to crushing, bottlenecking, notching, and bending in slip areas as is ordinary lightweight drill pipe. The product is two weights of the drill stem in one joint. The depth capacity of the rig is uprated by 15%. (*EI*, 1961)

2,035. CONTINUOUS-CORE DRILLING RIG

Henderson, H. I.

*Oil and Gas Journal*, v. 59, no. 19, pp. 96-100,  
May 8, 1961

In drilling with this continuous-core rig, the bits drill extremely long distances, circulation is not lost, and pipe does not stick. Core recovery in hard formations is 100% and is very high in soft formations. After the core is broken off, it becomes a free body which is brought by drilling fluid to the surface. Operation of the rig, the value of continuous cores, and costs are considered. (*EI*, 1961)

2,036. DEVELOPMENTS IN DRILLING  
CROSS-MEASURE BOREHOLES

Morgan, B. G.

*Iron and Coal Trades Review*, v. 182, no. 4843,  
pp. 997-1004, May 12, 1961; no. 4844, pp.  
1057-1067, May 19, 1961; (discussion) no. 4845,  
pp. 1121-1126, May 26, 1961

Results are presented which were obtained with a rotary drilling machine, with both tungsten carbide and diamond tipped drilling bits. Conditions encountered in drilling quartzites and hard shales are described in order to facilitate the methane drainage program. The results obtained using rotary percussive drilling are presented. (*EI*, 1961)

2,037. NEW ROCK STUDY MAY CUT  
DRILLING TIME, COST

*Oil and Gas Journal*, v. 59, no. 20, p. 110,  
May 15, 1961

As part of a drilling research program, studies were conducted on various rock types to determine effects of temperature, confining pressure, and rate of deformation on rock failure. Because the drilling aims at actually breaking the rock into pieces, brittle-type failure is desired, rather than ductile type in which rocks "flow" without losing cohesion. (*EI*, 1961)

2,038. DOWNHOLE SHOCK ABSORBER SAVES  
BITS, DRILL STRING, TIME, AND RIG

Shawver, G.

*Oil and Gas Journal*, v. 59, no. 20, pp. 160, 163,  
May 15, 1961

Savings in bit cost, round trips, and actual rotating time on many wells have been effected by damping out harmful down-hole variations. The tool runs immediately above the bit and uses a molded internal rubber section

to absorb shock loads ordinarily transmitted from the bit into the drill string. Rotary speed and bit weight can be varied over great ranges with no vibration in the string. (*EI*, 1961)

2,039. GET FULL LIFE FROM YOUR RIG'S  
WIRE LINE

Dull, R. G.

*Oil and Gas Journal*, v. 59, no. 21, pp. 74-77,  
May 22, 1961

An electronic computer was used to prepare tables which cover practically all drilling situations. A total of 462 ton-mile tables has been completed. Their use and the principles outlined will yield a cutoff and line-slipage program which will keep wear from concentrating in any one spot. (*EI*, 1961)

2,040. AIR-FOAM AERATED FLUID IN  
WEST TEXAS

Willborn, R.

*Oil and Gas Journal*, v. 59, no. 21, pp. 82-83,  
May 22, 1961

Field performances and techniques used in foam and aerated-fluid drilling are presented. Drilling rates with foam and with aerated fluid are greater than with mud, but they are not always as great as with straight air. Foam or aerated fluid makes a low-pressure drilling system just as does air. Pressure at the bit using foam and aerated fluid is not so low as with air alone. (*EI*, 1961)

2,041. NEW ANALYTICAL APPROACH TO  
DRILL PIPE BREAKAGE—2

Bogdanoff, J. L., Goldberg, J. E.

*ASME, Transactions of the, Series B—Journal  
of Engineering for Industry*, v. 83, no. 2,  
pp. 101-106, May 1961

Drill pipe dynamics, including torsional and longitudinal displacements, are formulated, assuming that forces which act at bit and sides of the pipe are random in nature. It is shown that by assuming certain criteria of failure, coupling constants may be adjusted to reduce probability of failure to a minimum. (*EI*, 1961)

2,042. NEW LOOK AT JET-PIERCING  
DEVELOPMENTS

Calaman, J. J., Rolseth, H. C.

*Engineering and Mining Journal*, v. 162, no. 5,  
pp. 100-104, May 1961

The production of jet-piercing speeds and the effect of backbreak, fissures, and cracks on piercing speed are

discussed. Blasthole chambering practices, advantages of drill-hole bottom chambers, oxygen supply methods and equipment, and composite jet-piercing performance in taconite and jasper are also considered. (*EI*, 1961)

**2,043. SETTING OF DIAMONDS IN HARD**

**MATRIX BITS**

Dauncey, G. B.

*Canadian Mining Journal*, v. 82, no. 5, pp. 67-69,  
May 1961

An investigation by the Diamond Research Laboratory, Johannesburg, is reported. To maintain drilling efficiency, polished surfaces must be retained. Tungsten, nickel, and iron damage a diamond most severely. A specification is given of the matrix in use. (*EI*, 1961)

**2,044. UNTERTAEGIGE BOHRVERSUCHE MIT  
EINEM FAHRBAREN BOHRPRUEFSTAND  
(UNDERGROUND DRILLING EXPERI-  
MENTS WITH PORTABLE DRILL  
TESTING STAND)**

Glantschnig, N.

*Zeitschrift fuer Erzbergbau und Metallhuettent-  
wesen*, v. 14, no. 5, pp. 228-232, May 1961

This study was designed to examine the efficiency of a device for drill dust removal. (*EI*, 1961)

**2,045. SCHNEIDEN- UND SCHAFTMATERIAL  
FUER SCHLAGBOHRWERKZEUGE (BIT  
AND ROD MATERIALS FOR  
PERCUSSION DRILLS)**

Jaeger, K.

*Neue Huette*, v. 6, no. 5, pp. 271-276, May 1961

A report is presented of large-scale testing of 10 unalloyed and alloy steels as rods and cutter heads, and of different hard metals as drill bits for mining operations. A review is included of soldering methods and materials for joining the bit and head. Low alloy heat-treated Cr-V steel was chosen for the rod, and a hard metal with 9% Co for the bit. (*EI*, 1961)

**2,046. VLIYANIE RADIALNYKH ZAZOROV NA  
ENERGETICHESKIE PARAMETRY  
IBALANS ENERGII TURBINY TURBOBURA  
(EFFECT OF RADIAL CLEARANCE ON  
ENERGY PARAMETERS AND ENERGY  
BALANCE OF TURBODRILL TURBINE)**

Shindin, A. N.

*Neftyanoe Khozyaistvo*, v. 39, no. 5, pp. 12-16,  
May 1961

An evaluation is given of the volume losses used to determine the effect of losses on momentum characteristics of a turbine. . . . (*EI*, 1961)

**2,047. ISSLEDOVANIE SHAROSHECHNOGO  
BURENIYA VZRYVNYKH SKVAZHIN NA  
KARERAKH TRESTA SOYUZASBEST  
(STUDY OF ROLLER BIT DRILLING OF  
SHOTHOLES IN QUARRIES OF  
SOYUZASBEST TRUST)**

Sukhanov, A. F., Nazarov, P. P., Kutuzov, B. N.  
*Gornyi Zhurnal*, v. 137, no. 5, pp. 34-37,  
May 1961

Roller bit drills proved to be 20 to 40% more efficient and cheaper than wire-line percussion drilling. Data are presented on the wear resistance of roller bits and the characteristics of recommended rigs for drilling 13- to 20-m-deep and 150- to 200-mm-D shotholes. (*EI*, 1961)

**2,048. DYNAMIC STRESSES IN LONG DRILL  
PIPE STRINGS**

Vreeland, T., Jr.

*Petroleum Engineer*, v. 33, no. 5, pp. B58, 60,  
May 1961

A study of dynamic stresses on long drill pipe strings due to setting slips while the pipe is moving evaluates the critical slip setting velocities and the effect of slowing down pipe velocities on the magnitude of these stresses. The study reveals the impracticality of shock absorbing devices. The manner of propagation of stresses, the influence of tool joints, and the reduction of dynamic stresses are considered. (*EI*, 1961)

**2,049. VERSCHLEISS BEIM GESTEINSBOHREN:  
MODELL-VERSUCHE (WEAR IN ROCK  
DRILLING: LABORATORY TESTS)**

Wahl, H., Kantenwein, G., Schaefer, W.

*Wear-Usure-Verschleiss*, v. 4, no. 3, pp. 234-245,  
May-June 1961

Tests were made relating to wear by rotary drilling, percussion drilling, rotary percussion drilling, and rotary drilling with roller bits in rock. New testing machines with which the motion and pressure conditions of real drilling could be imitated were devised for each drilling system. Fundamental laws of wear and drilling rate could be determined. 26 references. (*EI*, 1961)

**2,050. MEASURING TORQUE AND TENSION IN OIL FIELD DRILL PIPE WITH STRAIN GAGES**

Dean, J. T.

Instrument Society of America, Pittsburgh, Pa.  
Preprint 25-TC-61, presented at ISA Meeting,  
June 5-8, 1961

Construction and assembly are described of a strain gage transducer which rotates as part of a drill string in an atmosphere of drilling mud, air, or natural gas. Signals are transmitted from a transducer to a recorder through a large set of slip rings mounted on the rotating drill stem. (EI, 1961)

**2,051. RAPID BORING OF DEEP HOLES**

Carlstedt, R.

*American Machinist/Metalworking Manufacturing*, v. 105, no. 12, pp. 109-112, June 12, 1961

The advantages are given of a simple, fast, and precise boring technique which was developed in Germany at the end of the last war. Comparison is made with conventional gun drilling. Given consideration are internal chip disposal, a cutter head design, and a coolant system. Case histories are presented. Information is included on boring hardened steel, feeds for refractory metals, rapid boring Inconel, rapid feed on K-Monel, and boring titanium and other materials. (EI, 1961)

**2,052. POOR MUD MEANS LOWER PUMP EFFICIENCY, HIGHER DRILLING COSTS**

Marsee, J., Duran, R. J.

*Oil and Gas Journal*, v. 59, no. 24, pp. 129, 130, 133-136, June 12, 1961

Poor pump performance is generally the result of the type of mud used. Muds which tend to reduce pump efficiency are salt-gel, starch mud, gyp, Q-Broxin mud without sufficient Q-Broxin and proper pH control, high pH lime mud with poor pH and lime content control, ordinary bentonite muds contaminated with salt, cement, or anhydrite, and native muds containing too many solids inadequately dispersed. Case histories are given. (EI, 1961)

**2,053. DRILLING SPEED INCREASED WITH CONCAVE BIT**

*Mining and Chemical Engineering Review*, v. 53, no. 9, p. 56, June 15, 1961

The mathematical condition that satisfied the requirements of an efficient tip was a parabolic shape. This new design transfers energy more efficiently to rock, which is thereby fractured more easily. The new shape tends to focus stress waves within the cylindrical volume of rock that is being drilled, and this energy is concentrated in a formation of the hole instead of being fanned out and, to some extent, dissipated in other directions. (EI, 1961)

**2,054. COSDEN "FOAMS" OIL AND SALT WATER FROM GAS-DRILLED HOLE**

McGhee, E.

*Oil and Gas Journal*, v. 59, no. 25, pp. 96-97, June 19, 1961

When large quantities of salt water and oil were encountered in gas drilling, the contractor was successful in foaming the fluids out of the hole. Areas which were not economical to air drill in the past may now use this method. It will be easier to use air or gas to clean out or work over old wells. (EI, 1961)

**2,055. OUR CROOKED-HOLE PROBLEM?**

Knapp, S. R.

*Oil and Gas Journal*, v. 59, no. 25, pp. 103, 106, 108, June 19, 1961

An important factor in hole deviation is the formation dip. Deviation is caused because alternating layers of formation have different density or resistance to penetration by the bit. As the bit drills through these formations at an angle, the face of the bit encounters formations of different density at the same time, allowing the bit to move laterally into a less dense formation. Lateral movement may continue until stopped by legs of the bit and drill collar or some stabilizing device above the bit. (EI, 1961)

**2,056. WELLBORE PRESSURE SURGES PRODUCED BY PIPE MOVEMENT**

Burkhardt, J. A.

*Journal of Petroleum Technology*, v. 13, no. 6, pp. 595-605, June 1961

Field measurements and theoretical studies have been made of pressure surges produced by movement of pipe in mud-filled boreholes. Theory has successfully predicted the sequence and magnitude of positive and negative surges. The most important pressure surge is usually due to the viscous drag of flowing mud. (EI, 1961)

**2,057. HOW TO GET LONGEST LIFE FROM YOUR DRILLING EQUIPMENT**

Dahlin, C.

*Engineering and Mining Journal*, v. 162, no. 6, pp. 89-91, June 1961

An analysis is given of drilling conditions such as wet or dry drilling, properties of rock, size of rock drill, and care and handling of equipment. Results of tests with integral steel, extension steel, and detachable bits are discussed. Also considered are drill steel life factors, tungsten carbide life factors, types of insert wear, relation between rock and rock drills, influence of gage on insert life, and care and handling of drilling equipment. (*EI*, 1961)

**2,058. "W" GROUP DRILL RODS CUT DIAMOND CORE DRILLING COSTS**

Davies, R. E.

*Engineering and Mining Journal*, v. 162, no. 6, p. 106, June 1961

Mining companies and contractors report faster drilling and lower bit costs wherever new "W" group diamond drill rods are used. These new rods provide greater rigidity in drill string, reduce vibration, improve flow characteristics, improve rod life, and assure quicker coupling and uncoupling. (*EI*, 1961)

**2,059. O POVYSHENII EFFEKТИВНОСТИ ДОЛОТ ПРИ ТУРБИННОМ БУРЕНИИ ГЛУБОКИХ СКВАЗИН (INCREASE OF BIT EFFICIENCY DURING TURBINE DRILLING IN DEEP WELLS)**

Dzhalil-Zade, G. N., Movsumov, A. A., Mamedov, D. A., Dzhalilov, N. M.

*Neftyanoe Khozyaistvo*, v. 39, no. 6, pp. 6-11, June 1961

The use of a single-cone rotary bit is recommended as a means of increasing bit efficiency and reducing power consumption. The new method does not require a special device for the reduction of rpm. (*EI*, 1961)

**2,060. WHICH SHOWS FASTER PAYOUT, PLATFORMS OR OCEAN FLOOR COMPLETIONS?**

Shields, C. M., Field, A. J.

*World Oil*, v. 152, no. 7, pp. 91-94, June 1961

Questions dealing with engineering and economic aspects of underwater completions are posed. Consider-

ations which might make undersea completions more attractive are presented. Cost advantages of ocean-floor-type completion vs. fixed platform completion are cited. Equipment used in underwater completion is examined. (*EI*, 1961)

**2,061. HOW TO EVALUATE PIPE STRESSES WHEN DRILLING FROM FLOATING VESSEL**

Lind, E. R.

*World Oil*, v. 152, no. 7, pp. 95-101, June 1961

Stresses which increase with increase in hole depth are discussed, in addition to those normally encountered. Axial tensile stress due to weight of tubing, bending stress due to the vessel being displaced from over hole, and bending stress due to vessel roll are included. Formulas are given for deep holes; calculations are made of limits of displacement and roll; and maximum allowable working stress is estimated. The effects of various hole depths, water depths, ocean currents, and diameter and thickness of tubing are pointed out. (*EI*, 1961)

**2,062. NEW IDEA IN DRILL PIPE FIELD TESTED**

*Petroleum Engineer*, v. 33, no. 6, pp. B24-26, June 1961

A patented manufacturing technique makes it possible to provide a pipe incorporating two-wall thickness in one pipe with a smooth internal taper from heavier to lighter wall. Extra strength in slip area is provided while maintaining regular API weight for the remainder of the pipe. A new pipe, known as dual weight, is made in thin wall or standard wall thickness. Results of field tests are presented, (*EI*, 1961)

**2,063. NEW TURBODRILL SIMPLIFIES DIRECTIONAL DRILLING**

Razi Ghavami, S.

*Petroleum Engineer*, v. 33, no. 6, pp. B34, 36, 40, June 1961

To overcome disadvantages in design, a new turbodrill was developed in the Soviet Union which enables the driller to start and stop rotation of bit as desired. The construction of the new turbodrill is discussed. The new design is expected to solve many problems connected with directional drilling, and orientation methods. Pipe turning angle and bit orientation are also considered. (*EI*, 1961)

2,064. PROJECT MOHOLE DEMONSTRATES  
DEEP WATER DRILLING TECHNIQUES  
Wilson, G. M.  
*World Oil*, v. 152, no. 7, pp. 84-90, June 1961

Using outboard motors to hold position in open ocean, CUSS I drills and cores Miocene sediments and basalt in 11,700 ft of water 90 mi off the coast of Lower California. The reduction of bending stresses and design of drill collar string are discussed. (*EI*, 1961)

2,065. SLIM HOLES CAN CUT HARD-ROCK  
DRILLING COST

Pool, F. M.  
*Oil and Gas Journal*, v. 59, no. 29, pp. 81-83,  
July 17, 1961

With the rig properly sized to match horsepower and hydraulic requirements, the contractor can drill slim holes cheaper than conventional size holes. The saving applies to hard as well as soft formations. Requirements, penetration rate, and feet drilled per bit are compared for conventional and slim holes. The procedure used in drilling hard and medium-hard late Paleozoic sections of West Texas is described. (*EI*, 1961)

2,066. TWO ROCK DRILLING TECHNIQUES  
*The Engineer*, v. 212, no. 5504, pp. 114-115,  
July 21, 1961

In "overburden drilling," developed in Sweden, rock can be blasted without first removing overburden. This method uses a drill pipe with an inner drill for making a charge hole. The inner unit is removed, and plastic pipe inserted to form a connection prior to removal of the drill pipe. "Jora Lift," for shaft raising, has its own compressed air driven hoisting gear. (*EI*, 1961)

2,067. DIE METHODIK DER UNTERSUCHUNG  
SCHLAGENDER WERKZEUGE (METHOD  
OF TESTING PERCUSSIVE  
INSTRUMENTS)  
Engel, L.  
*Bergbauwissenschaften*, v. 8, no. 14, pp. 321-324,  
July 25, 1961

The method of measurement of power characteristics of pneumatic pick and hammer drill is described. Motion can be determined by high-speed photography, and stress on the hammer drill can be measured under different working conditions with an ac strain gage. (*EI*, 1961)

2,068. LONGER DRILL STEEL BEING MADE  
ON RAND  
*South African Mining and Engineering Journal*,  
v. 72, no. 3573, pp. 189, 191, July 28, 1961

With the installation of a new steel carburizing furnace and equipment at Avesta works, improvements in fatigue-life of drill steel can be extended to any length of rod that can be rolled by steel manufacturers. The electrically heated, gas carburizing furnace is vertical pit type, operating at maximum temperature of 1050°C and with rating of 235 kw in three equal zones. (*EI*, 1961)

2,069. KOMPLEKSNYI RASCHET PARAMETROV  
UDARNO-VIBRATSIONNYKH MASHIN  
(COMPLEX METHOD OF CALCULATING  
PARAMETERS OF PERCUSSIVE-  
VIBRATION DRILLS)  
Ashavskii, A. M.  
*Gornyi Zhurnal*, v. 137, no. 7, pp. 47-50,  
July 1961

A system consisting of a vibration hammer, drilling tool, and rock is analyzed. The use of an electronic model for study of all factors affecting dynamics of the work is described. (*EI*, 1961)

2,070. STRAIN-WAVE BEHAVIOR IN PERCUSSIVE  
DRILL STEELS DURING DRILLING  
OPERATIONS  
Hawkes, I., Chakravarty, P. K.  
*Mine and Quarry Engineering*, v. 27, no. 7, pp.  
318-326, July 1961; no. 8, pp. 367-373,  
August 1961

Stresses induced in operating drill steel can be explained by an elementary one-dimensional theory of stress propagation. Wavelength and waveform of an initial strain wave generated by piston impact are directly related to dimensions and shape of the piston. The amplitude of strain waves is directly proportional to air pressure and blows/min over a range of 20 to 70 psi. The process of energy transfer from drill steel to rock is explained. (*EI*, 1961)

2,071. HORIZONTAL AIR DRILLING  
Lewis, N. O.  
*Mining Congress Journal*, v. 47, no. 7, pp. 59-61,  
July 1961

Two major methods of horizontal drilling are auger drilling without air, and rotary drilling with air. A twin-

head or dual mast horizontal rotary drill working at Missouri coal mine is drilling 6½-in.-D holes in hard shale. Production of over 2000 ft of drilled hole in one regular shift is not unusual, and the average penetration rate is 360 ft/hr. Advantages of auger and rotary drilling are stated. (*EI*, 1961)

**2,072. HOW NEW FOAMING AGENTS ARE  
AIDING AIR/GAS DRILLING**

Lummus, J. L., Randall, V.

*World Oil*, v. 153, no. 1, pp. 57-62, July 1961

Results are given of laboratory and field tests on hundreds of foaming agent compounds to determine the most effective agent in combating influx in wells being drilled by air or gas. Foaming agents for water and oil and the use of foaming agents in drilling and workover operations are considered. (*EI*, 1961)

**2,073. PUTI POVYSHENIYA EFFEKTIVNOSTI  
TURBIN TURBOBUROV (MEANS OF  
INCREASING EFFICIENCY OF TURBO-  
DRILL TURBINES)**

Lyubimov, B. G.

*Neftyanoe Khozyaistvo*, v. 39, no. 7, pp. 11-15,  
July 1961

Defects in castings during production of turbines can be avoided by applying the lost wax process, or die pressing of plastics and use of the latter as a substitute for steel. The efficiency of a conventional steel cast turbine is 69%, while that of a plastic turbine is 76.2%. (*EI*, 1961)

**2,074. WIRELINE DRILLING IN AUSTRALIA**

*Mining and Chemical Engineering Review*,  
v. 53, no. 10, pp. 46-48, July 1961

A new wire-line core drilling technique and equipment are being used in a coal field and other exploratory drilling in Australia. Wire-line equipment eliminates pulling out and disconnecting the entire rod string at the end of each core run. In a 1000-ft hole only 15 min elapsed between break-off and resumption of drilling. A wire-line core barrel is fitted with a special retractable inner tube and can be withdrawn without removing drill rods from the borehole. (*EI*, 1961)

**2,075. SMALLER VOLUMES FROM STANDARD  
MUD PUMPS**

Liljestrand, W. E.

*Oil and Gas Journal*, v. 59, no. 34, pp. 82-90,  
August 21, 1961

An analysis is presented of most and least efficient ways to run a mud pump for low output rates. The effect of removing valves on pressure curves caused by remaining piston strokes is discussed as well as the effect of valve removal on rod load, horsepower, and maximum pressure. Optimum pattern of valve removal and factors in reduction of rate of flow are covered. (*EI*, 1961)

**2,076. DEVELOPMENTS IN LARGE BOREHOLE  
DRILLING**

Mauck, H. E., Ridenour, D. C.

*Mining Congress Journal*, v. 47, no. 8, pp. 77-80,  
August 1961

A West Virginia coal mining company has developed a rapid and inexpensive method of drilling large diameter drill holes for removal of methane and providing escape in emergency. The method used was that of rotary drilling making use of Hughes' cutting bits mounted on a special powered barrel. A pregrouting procedure is described. (*EI*, 1961)

**2,077. OFFSHORE OIL-WELL DRILLING  
STRUCTURES**

Willsea, F.

*Civil Engineering*, New York, v. 31, no. 8,  
pp. 51-53, August 1961

Design and construction of offshore structures present difficult problems of stability and of resistance to wind, wave, earthquake, corrosion, and varying loads. Platforms range from artificial islands to barges and are used for drilling, production of gas and oil, exploration of under-water deposits, and also for laying sewer outfall. The man-made Rincon Island in California and the barge-mounted leg-extending Pacific Driller No. 1 are described as examples. Problems of construction of various types are discussed. (*EI*, 1961)

**2,078. OIL WELL RIG USES PIPED  
HYDRAULIC POWER**

*Engineering*, v. 192, no. 4977, p. 296,

September 8, 1961

(See also *The Engineer*, v. 212, no. 5511, p. 407,  
September 8, 1961)

A drive unit runs on piped hydraulic power. Use of the hydraulic circuit allows diesel engines to be remote from drawworks and the rotating table, which reduces noise, and also the weight load on the drilling platform to about one quarter the normal figure. The arrangement is shown in a diagram. (*EI*, 1961)

- 2,079. LOWER ANNULAR VELOCITY AND JET-BIT HYDRAULICS SPEED DRILLING  
Bumgardner, B. M.  
*Oil and Gas Journal*, v. 59, no. 37, pp. 137, 139, 141, 144-145, September 11, 1961

Instead of using high rising mud velocities during drilling, it has been proved that lower velocities, 100-120 ft/min, are adequate in most California formations. Using lower annulus velocity means that less mud need be circulated; less mud means that surface pressures can be higher and that more of the pressure loss can be taken at the bit where it does most good. It also means most effective jet-bit action to speed drilling and cut costs. (EI, 1961)

- 2,080. TO PREVENT TROUBLE IN DUAL COMPLETIONS  
Porter, W.  
*Oil and Gas Journal*, v. 59, no. 38, p. 185, September 18, 1961

Mechanical orientation of a perforating tool with Welex "Sidekicker" prevents a perforating gun from shooting holes in long tubing string. The tool is lowered through tubing, with a spring-loaded arm folded against the body of the tool; when it falls into casing below tubing, the arm unfolds and forces the tool against casing, so there is no "standoff." (EI, 1961)

- 2,081. OVERBURDEN DRILLING METHOD  
*Mining Journal*, v. 257, no. 6580, pp. 311-312, September 29, 1961

The overburden drilling method is a new technique by which drilling is carried out through subsoil and boulders, under water, and to and through bedrock, economically and at faster penetration rates. The method requires special equipment, consisting of Atlas Copco rock drills with powerful independent rotation, chain feeds, and Sandvik Coromant special drill pipes with standard extension steels. The high-pressure water flushing contributes to fast penetration rate. (EI, 1961)

- 2,082. PREVENTIVE MAINTENANCE FOR DRILL STEELS  
*South African Mining and Engineering Journal*, v. 72, no. 3582, pp. 737, 739, September 29, 1961

A new drill steel maintenance procedure is designed to overcome certain sporadic shank riveting problems which are occasionally encountered. Eight sets of operating conditions are reviewed that can arise during drilling

and that can cause riveting, flaking, and work-hardening of the striking end and cupping of pistons. A solution of wear problems is derived. (EI, 1961)

- 2,083. STRESSES CAUSED BY BIT LOADING AT CENTER OF HOLE  
Cheatham, J. B., Jr., Wilhoit, J. C., Jr.  
*Society of Petroleum Engineers, Journal of the*, v. 1, no. 3, pp. 177-183, September 1961

Stress distribution around a short cylindrical cavity subjected to bit loading, overburden, and drilling-fluid pressures is determined by means of an analytical solution which satisfies boundary conditions of the problem. Stresses at the corner of the hole are 35% lower than comparable results obtained by photoelastic and relaxation analysis. This difference is apparently due to large radius of curvature at the corner of the cavity. (EI, 1961)

- 2,084. REZULTATY ISPYTANII BUROVOGO STANKA BSSH (RESULTS OF TESTING DRILLING RIG BSSH)  
Nankin, Yu. A.  
*Gornyi Zhurnal*, v. 137, no. 9, pp. 24-25, September 1961

This rig is designed for use of a roller bit in 200-mm-D shotholes up to 24 m deep. The rate of drilling at various rpm, axial strain, and hardness of rock are discussed. (EI, 1961)

- 2,085. ZAVISIMOST MOMENTA NA SHAROSHECHNYKH DOLOTAKH OT OSEYOI NAGRUSKI (DEPENDENCE OF ROTARY BIT MOMENTUM ON AXIAL LOAD)  
Polyakov, V. S., Kruchinin, I. G.  
*Neftyanoe Khozyaistvo*, v. 39, no. 9, pp. 7-12, September 1961

Dependence is expressed by formula of second-order parabola. Dependence of momentum on displacement of the roller bit axis is discussed. (EI, 1961)

- 2,086. COMING BATTLE: ALUMINUM DRILL PIPE VS. STEEL  
McGhee, E.  
*Oil and Gas Journal*, v. 59, no. 40, pp. 97-100, October 2, 1961

The performance record of aluminum pipe in drilling 100,000 ft of hole during a 12-month period is presented.

An ultrasonic inspection showed only minor defects. There was no evidence of stress-corrosion cracking, and slip and tong marks left no damage. There were no twist-offs or other failures, nor was there measurable wear from corrosion. Prospects for aluminum drill pipe and casing are considered. (*EI*, 1961)

- 2,087. SOVIETS PLAN FIVE MOHOLE-TYPE TESTS  
*Oil and Gas Journal*, v. 59, no. 40, pp. 116-117,  
October 2, 1961

The Soviet project will consist of an attempt to drill five superdeep tests in a 10- to 15-km range. The holes will be drilled in the Baku area, Caspian Sea, Karelia, Urals and Kurile Islands, and are designed to drill through cross sections of all types of rocks. Specific objectives of the project are discussed. (*EI*, 1961)

- 2,088. UNTA BASIN DRILLERS CUT WELL COSTS DESPITE UNCERTAINTIES  
McGhee, E.  
*Oil and Gas Journal*, v. 59, no. 40, pp. 142-146,  
October 2, 1961

Random occurrence of water in many formations in the Uinta basin causes uncertainties in drilling. Some holes find water in small enough volumes that the hole can be "mist drilled" or "aerated-water drilled" (at slower speed) to a casing point. Other problems discussed include sensitivity of formations to water, geographical remoteness, and lack of surface water. (*EI*, 1961)

- 2,089. ERPROBUNG EINER BEWEGLICHEN, SCHLAGWETTERGESCHUETZTEN FERNSCHEINRICHTUNG FUER ENGE BOHRLOECHER (TESTING OF PORTABLE EXPLOSION PROOF TELEVISION SETS DESIGNED FOR SMALL DIAMETER BOREHOLES)  
Otto, G.  
*Glueckauf*, v. 97, no. 21, pp. 1302-1306,  
October 11, 1961

Design and construction of the apparatus, its optics, and electronic control are presented. The camera lowered into boreholes enables checking thickness of coal bed, locating position of faults and fractures, and studying lithology. (*EI*, 1961)

- 2,090. TO OPEN: DIG ON THE DOTTED LINE; ROCK DRILLS SUSPENDED FROM RUBBER-TIRED HYDRAULIC CRANE  
*Engineering News-Record*, v. 167, p. 24,  
October 12, 1961

- 2,091. ROTARY TABLE AIDS DEEP DRILLING  
Dow, J.  
*American Machinist/Metalworking Manufacturing*, v. 105, p. 134, October 16, 1961

- 2,092. GAS TURBINE SCORES IN AIR DRILLING  
Bike, P. B.  
*Oil and Gas Journal*, v. 59, pp. 131-132, 134-135,  
October 23, 1961

- 2,093. FREIGHTER CONVERTED TO UNIQUE DRILLING PLATFORM  
*Oil and Gas Journal*, v. 59, pp. 210-211,  
October 30, 1961

- 2,094. THREADLESS DRILL PIPE TOOL JOINT  
Kastrop, J. E.  
*Petroleum Management*, v. 33, no. 11, pp. 88, 90,  
94, 98, October 1961

This threadless joint is an adaptation of a patented principle used in an existing and proven safety joint, called right-hand torque releasing safety joint. The tool joint simply and quickly disengages the drill pipe from the casing assembly, after cementing the pipe, and also engages it again for subsequent drilling and testing operations. A method of making and breaking connection is discussed. The stage of development, and results of tests and use are also reported. (*EI*, 1961)

- 2,095. A LOOK AT ROCKET FLAME DRILLING  
*Petroleum Management*, v. 33, no. 11, pp. 100,  
102, 105-106, October 1961

The jet piercing process used in mining is based upon cracking of rock due to differential expansion of minerals in rock. A jet piercing blowpipe or drill assembly consists of a swing joint, kelly and burner assembly. A critical feature and the subject of most research is the burner. Penetration speeds improve with depth as rock becomes more solid, less weathered and less oxidized. Penetration speeds in various rocks are given as well as oxygen supply data and drilling performance. (*EI*, 1961)

**2,096. WHAT'S NEW IN PATENTS**

*Petroleum Management*, v. 33, no. 11,  
pp. 108-109, October 1961

An electric arc for drilling wells, a high-speed turbo-drill with reduction gearing, a retractable drill bit to eliminate round trips, and a prestressed drill stem permitting longer strings are among the devices patented..

**2,097. CONTROL OF NOISE AT DIAMOND DRILLS**

Morissette, R. A.  
*Canadian Mining Journal*, v. 82, no. 10,  
pp. 75-80, October 1961

In order to reduce the noise level of 100 db on a diamond drill, as well as to reduce fog, mufflers were added to several machines on a trial basis. Construction of units consisted of distinctive manifold to which a special hose was clamped, with standard car muffler attached to other end of this hose. Four types of steel adaptors were designed for exhaust parts to manifold. Noise reduction was found to be very successful, and noise reduction data are given. Penetration rates were not affected. (*EI*, 1961)

**2,098. HIGHER AIR PRESSURES FOR DOWN-THE-HOLE PERCUSSIVE DRILLS**

Pfleider, E. P., Lacabanne, W. D.  
*Mine and Quarry Engineering*, v. 27, no. 10, pp.  
463-468, October 1961; no. 11, pp. 496-501,  
November 1961

A theoretical treatment examines a means of increasing rate of penetration without exceeding strength of a drill bit. Air-flow resistance through drill stems, bits, and annulus are compared for diverse free air volumes at different pressures indicating lower percentage losses for higher operating pressures. Drills which require higher pressures generally require larger volume of air, thus increasing upward air velocities. (*EI*, 1961)

**2,099. INCREASING OCCURRENCE OF ABNORMALLY HIGH RESERVOIR PRESSURES IN BOREHOLES, AND DRILLING PROBLEMS RESULTING THEREFROM**

Thomeer, J. H. M. A., Bottema, J. A.  
*American Association of Petroleum Geologists, Inc., Bulletin of the*, v. 45, no. 10, pp. 1721-1730,  
October 1961

**2,100. PREVENTATIVE MAINTENANCE FOR ROCK DRILLS**

*Compressed Air Magazine*, v. 66, pp. 26-27,  
October 1961; pp. 24-25, November 1961;  
pp. 19-21; December 1961; v. 67, pp. 23-25,  
January 1962

**2,101. BIT RECORDS SHOW PROGRESS IN DRILLING MORE HOLE FOR FEWER DOLLARS**

Payne, L. L., Woods, H. B., Grant, R. S.  
*Oil and Gas Journal*, v. 59, pp. 120-124,  
November 6, 1961

Rotary drilling trends are considered.

**2,102. PREVENT DOG-LEGS, STOP BOTTOM-JOINT CASING FAILURES**

Gallon, J.  
*Oil and Gas Journal*, v. 59, no. 46, pp. 190-191,  
November 13, 1961

Typical troubles experienced by a French drilling contractor when drilling a small-diameter hole below a larger one are discussed. Troubles took the form of tight spots in hole, key seats, or bottom joints of intermediate casing being knocked loose in hole. The source of difficulties was a dog leg created by poor drilling practices when commencing a small hole below a larger one. Dog legs are avoided by using hole-deviation charts to figure the weight to be carried by a bit in a small hole. (*EI*, 1961)

**2,103. SYMPOSIUM ON DIAMOND DRILLING**

*Mining and Chemical Engineering Review*, v. 54,  
no. 2, pp. 55-61, November 15, 1961

A symposium held at Broken Hill, New South Wales, revealed data on the following aspects of Australian diamond drilling industry: rigs, drill design and instrumentation, pumps and hydraulics, maintenance, drill rods, barrels and bits, and drill-hole surveying and deviation. A summary is given of nineteen technical papers presented at the symposium. (*EI*, 1961)

**2,104. IMPORTED BORING RIGS COMPLETE TOUGH FOUNDATION JOB**

*Engineering News-Record*, v. 167, pp. 36-37,  
November 30, 1961

2,105. PRELIMINARY DRILLING PHASE OF MOHOLE PROJECT

Horton, E. E., Riedel, W. R., Ladd, H. S., Tracy, J. I., Jr., Bramlette, M. N., McLelland, J. I., Engel, C. G., Engel, A. E. J.  
*American Association of Petroleum Geologists, Inc., Bulletin of the*, v. 45, no. 11, pp. 1789-1800, November 1961

A report of drilling operations and results of coring operations and logging at Guadalupe and La Jolla sites in 1961 are presented. Chemical and mineral composition of cored basalts are compared with olivine and plateau basalts. (*EI*, 1961)

2,106. AIR-GAS WORKOVERS CAN MAKE MONEY FOR YOU

Mayer, E. H.  
*World Oil*, v. 153, no. 6, pp. 95-101, November 1961

Recent advances in techniques and equipment which have contributed to success in using air, gas, and aerated or gaseated fluids in completion and workover jobs include the following: improved stability of air- or gas-drilled holes, reduced formation sloughing through use of oil-base-type bell packing mud, improved fishing techniques for gas drilling, and ability to determine bottom water contacts through sampling and cutting of formation fluid returns. (*EI*, 1961)

2,107. NEW CORE ORIENTATION DEVICE

Roxstrom, E.  
*Economic Geology*, v. 56, no. 7, pp. 1310-1313, November 1961

A Craelius core orientation device is placed in a core barrel and makes measurement of a number of points of the drill hole bottom configuration within a section, which will be the upper surface of the core removed. (*EI*, 1961)

2,108. BIG COMPRESSORS PUT VERSATILITY INTO ROCKY MOUNTAIN AIR DRILLING

McGhee, E.  
*Oil and Gas Journal*, v. 59, pp. 122-125, December 4, 1961

2,109. TWO-TUBE PIPE CUTS DRILL-PIPE HANDLING, STRING FAILURES

McGhee, E.

*Oil and Gas Journal*, v. 59, pp. 97-100, December 18, 1961

2,110. NEW ROAD TO MANHATTAN; ROCK AND SWAMPLAND YIELD TO AIR POWER

Nemmers, R. J.  
*Compressed Air Magazine*, v. 66, pp. 8-11, December 1961

2,111. WINTER DRILLING PROGRAM UNDER WAY FOR B.C.

*Oil and Gas Journal*, v. 60, p. 115, January 8, 1962

2,112. SWEDISH LADDER DRILLING SAVES MAN-HOURS

*Engineering News-Record*, v. 168, pp. 28-29, January 11, 1962

2,113. AS THIS ARCTIC TEST DRILLS DEEPER, PLANS ARE FORMING FOR ANOTHER FRIGID WILDCAT

*Oil and Gas Journal*, v. 60, pp. 64-65, January 15, 1962

2,114. SMALL TRENCHER AND POWER DRILL HELP INSTALL GAS LIGHTS

*Gas Age*, v. 129, pp. 10-11, January 18, 1962

2,115. LAB TESTS SIMPLIFY ROCK DRILLING

*Engineering News-Record*, v. 168, p. 165, January 25, 1962

2,116. TWO-DIMENSIONAL STUDY OF ROCK BREAKAGE IN DRAG-BIT DRILLING AT ATMOSPHERIC PRESSURE

Gray, K. E., Armstrong, F., Gatlin, C.  
*Journal of Petroleum Technology*, v. 14, pp. 93-98, January 1962

2,117. STEP-ALONG DRILL MOVES QUICKLY ON ORDERS FROM COMPUTER

DeVoss, E. A.  
*Iron Age*, v. 189, pp. 92-93, February 1, 1962

2,118. SIGNAL PLANS BIG PLATFORM

*Oil and Gas Journal*, v. 60, p. 82, February 12, 1962

- 2,119. SMALL-TRACT DRILLING FACES  
A NEW ATTACK  
*Oil and Gas Journal*, v. 60, pp. 64-65,  
February 19, 1962
- 2,120. BOTTOM SCAVENGING: MAJOR FACTOR  
GOVERNING PENETRATION RATES  
AT DEPTH  
Van Lingen, N. H.  
*Journal of Petroleum Technology*, v. 14 T,  
pp. 187-196, February 1962
- 2,121. PAVEMENT CORE DRILLS WORK  
THROUGH BUS FLOOR  
*Roads and Streets*, v. 105, pp. 39-40,  
February 1962
- 2,122. SQUARE PEGS IN A ROUND HOLE;  
SQUARE DRILL COLLARS  
Bingman, W. E.  
*Oil and Gas Journal*, v. 60, pp. 177-180,  
March 19, 1962  
(See also *Petroleum Management*, v. 34,  
pp. 84+, April 1962)
- 2,123. INCLINED DRILLING PROVES BEST AT  
CANADIAN JOHNS-MANVILLE'S  
JEFFREY PIT  
Milosevic, M. I.  
*Engineering and Mining Journal*, v. 163,  
pp. 86-90, March 1962
- 2,124. MOHOLE PROJECT  
Thornburg, R. B.  
*Instruments and Control Systems*, v. 35,  
pp. 137-139, March 1962
- 2,125. HOW TO GET THE MOST FROM  
NONMAGNETIC COLLARS FOR  
DIRECTIONAL DRILLING  
Chadderdon, J., Kittinger, W. T.  
*Oil and Gas Journal*, v. 60, pp. 104-109,  
April 16, 1962
- 2,126. 1,600-FT. SEWER INSTALLED BY  
HORIZONTAL BORING  
Turner, G. M., Jones, F. T.  
*Civil Engineering*, v. 32, pp. 60-61, April 1962
- 2,127. OIL WELL DRILLING PIPE PROVING  
OUT IN THE FIELD  
*Light Metal Age*, v. 20, pp. 14-15, April 1962
- 2,128. ELECTRIC-ARC DRILLING MAY  
BE NEAR  
*Petroleum Management*, v. 34, p. 92, April 1962
- 2,129. DIFFERENTIAL PRESSURE STICKING:  
LABORATORY STUDIES OF FRICTION  
BETWEEN STEEL AND MUD FILTER  
CAKE  
Annis, M. R., Monaghan, P. H.  
*Journal of Petroleum Technology*, v. 14 T,  
pp. 537-542, May 1962; (discussion by  
H. D. Outmans) pp. 542-543, May 1962

## BLASTING MECHANISMS AND EQUIPMENT

### 2,130. POSSIBLE USE OF SHAPED EXPLOSIVE CHARGES IN MINING

McPherson, G.

*Institution of Mining and Metallurgy, Bulletin of the*, no. 490, September 1947; (discussion) no. 493, pp. 29-41, December 1947

(See also *Rhodesian Mining Journal*, v. 19, no. 244, pp. 267, 269, 271, 273, September 1947)

A description of the construction and functioning of parts of certain military armor piercing weapons involving "shaped explosive charges" is presented. Included are the theory of shaped charges; practical points on design of devices for jet production; materials for the construction of shaped charges; penetration of materials by jet; and possible uses for blasting rock. Safety should be given special attention. (*EI*, 1947)

### 2,131. SCIENTIFIC APPROACH TO INDUSTRIAL APPLICATION OF SHAPED CHARGES

Lawrence, R. W.

*Explosives Engineer*, v. 25, no. 6, pp. 171-173, 182-183, November-December 1947

The Munroe effect, discovered in 1888, demonstrates the increased penetrating power of an explosives charge having a cavity in its base. The nature of shaped charges is described. The application to military and industrial purposes is discussed, particularly drilling holes in loose earth. Boulder blasting, secondary blasting in quarries, and seismic prospecting are mentioned. (*EI*, 1948)

### 2,132. COLD WEATHER TESTS ON SHAPED CHARGES FOR HOLE DRIVING AT FORT CHURCHILL, MANITOBA,

WINTER 1948-49

Storrar, A. G.

April 12, 1949

Signal Corps Engineering Laboratories,  
Coles Signal Lab., Fort Monmouth, N.J.

Test Report T-1198, TIP-U69025

Several types of shaped charges were tested to determine their suitability in driving holes for guy stakes and transmission poles. Although the M9-A1 and M6-A3 were adequate for driving ground stakes, their use was not recommended. They cannot be used in close proximity

to other equipment or shelters, and they leave a black smear on the snow which could reveal position to the enemy. The holes made by M2-A3 and M3 were inadequate for poles; neither the size nor the shape was right. These explosives also left a black smear on the snow, and it would be necessary to route pole lines several hundred yards from existing structures to prevent damage from blasting. Material from the holes scattered, thus necessitating hauling the material in for tamping the earth. The size of the hole made by the armor-piercing 30-caliber rifle bullet was inadequate.

### 2,133. SHAPED OR HOLLOW CHARGE

Davidson, S. H., Westwater, R.

*Mine and Quarry Engineering*, v. 15, no. 5, pp. 140-145, May 1949

An explanation of the mechanism of a shaped charge is given. Applications are considered, and it is concluded that shaped charge devices have only a limited application in commercial fields. A bibliography is included. (*EI*, 1950)

### 2,134. BLASTING OPERATIONS

Peel, J. J., Translator

October 1953

Snow, Ice, and Permafrost Research Establishment, Wilmette, Ill.

SIPRE Translation 23

AD-24,700

(Translation of "Vzryvnye Raboty,"

by N. B. Lobotskii, available in

*Stroitelnaya Promyshlennost*, v. 21, 1943)

### 2,135. FUNDAMENTAL STUDIES OF SMALL CRATERING CHARGES (FOXHOLE CHARGES)

Moses, S. A.

December 20, 1955

Stanford Research Institute, Poulter Labs.,  
Menlo Park, Calif.

Final Report, Volume 1, DA 44-009-eng-2119

AD-97,447

Research was undertaken to determine (1) the relationships between a given explosive charge and the resulting

crater, (2) the physical mechanisms which are involved in the formation of a crater by an explosive charge, and (3) the feasibility of deriving a formula which will correctly predict the size and shape of crater which can be produced by an explosive charge. Results indicated that explosive charges placed on the surface of the Earth produced only small bowl-shaped craters. A heavy charge produces a larger crater than a small charge at the same depth. The crater size is dependent on the depth of burial (until a camouflet is formed). Two buried charges of equal weight, but different shape, produce equivalent craters when the depth of burial is calculated to the center of mass of the two. The volume of the crater is independent of the type of explosive, the detonation velocity, and the method of detonation. Craters produced in dry soil are usually filled with powdered earth, whereas craters produced in moist soil tend to be cleaner. Craters formed in moist earth appear larger than those formed by similar charges in dry earth. Large charges and charges which are only slightly buried produce cleaner craters than those produced by small or deeply buried charges. A crater can be partially cleaned by two charges when the top charge is detonated approximately 1 sec ahead of the lower. A deep narrow crater can be produced by two charges similarly detonated. The relationship between the volume of a crater  $V$ , the weight of the explosive charge  $W$ , and the depth of burial  $D$  is expressed:  $V = 14W^{1/2}D + 0.1(1+W)e^{3/2}D + (1+0.3W)$ . A foxhole charge was developed which produces satisfactory foxholes in hard soil; the explosive in the foxhole charge shatters the dirt but does not clean the hole. (ASTIA)

**2,136. THE SHAPED CHARGE IN MINING AND METALLURGY, INDUSTRIAL APPLICATION**

Tardif, H. P.

1955

Canadian Armament Research and Development Establishment, Quebec

Report

AD-117,968

(See also *Canadian Mining Journal*, v. 77, no. 7, pp. 53-58, 75-76, July 1956)

When security regulations were lifted at the end of World War II and the secret of the devastating powers of the Bazooka and of the PIAT were made public, people speculated on the possibilities of industrial uses of the shaped charge principle. The purpose of this paper is twofold: first, to indicate some of the advances made in the adaptation of the principles of the shaped charge

to industrial applications and survey and analyze the results published to date; second, the object of this paper is to call the attention of the mining, metallurgical and oil industry in Canada to the possibility of applying shaped charges for their operations. The part of the bibliography covering practical applications was made as complete as possible and it is hoped that it may be of some use to readers. 49 references. (ASTIA)

**2,137. EXCAVATIONS IN FROZEN GROUND.**

**PART I. EXPLOSION TESTS IN KEWEENAW SILT**

Livingston, C. W.

July 1956

Mining Research Corporation, Denver, Colo.

Report, SIPRE 30, DA 11-190-eng-8

AD-115,156

Explosion tests were conducted in frozen Keweenaw silt to determine: (1) the most efficient type of explosive for blasts in frozen ground, (2) the fundamental relation between weight of the explosive and the depth of charge, (3) the proper position of the charge relative to the frozen-ground interface, (4) the feasibility of fracturing the frozen layer by placing a charge in the underlying unfrozen material, and (5) the effect of the diameter of the borehole and of the shape of the charge upon the results of blasting. Information obtained from the tests applies to the specific problem of excavating in frozen ground and to fundamental explosives research. Conclusions and recommendations, based on this information, are presented concerning (1) the feasibility of using explosives for foxholes in frozen ground, (2) methods of placing the charge, (3) mechanics of crater formation, (4) the crater equation, (5) future instrumentation, (6) classification of explosives, and (7) correlation of blast data. (ASTIA)

**2,138. UEBER DAS WESEN DER HOHLLADUNG (CONCERNING THE CHARACTERISTICS OF HOLLOW CHARGE)**

Schardin, H.

*Verein Deutscher Ingenieure Zeitschrift*, v. 98, no. 33, pp. 1837-1842, November 21, 1956; no. 36, pp. 1949-1953, December 21, 1956

A theory is presented for hollow explosive charge transformation of chemical into kinetic energy. Also considered are devices for acceleration of mass during detonation. Military applications and civilian applications, such as rock detonations, perforation in oil well production, and tapping of blast or open hearth furnaces, are pointed out. 26 references. (EI, 1957)

- 2,139. ERFAHRUNGEN MIT EXPERIMENTELLEN  
UNTERSUCHUNGEN DES EINFLUSSES  
DER SCHIESSARBEITEN AUF DIE  
STANDFESTIGKEIT DER PFEILER  
ZWISCHEN DEN KAMMERN IM SALZ-  
BERGWERK SOLOTWIN (EXPERIMENTAL  
INVESTIGATION OF EFFECT OF BLAST-  
ING ON STABILITY OF PILLARS  
BETWEEN ROOMS IN SOLOTVINA SALT  
MINE, SOVIET UNION)

Dreyer, W.

*Bergbauwissenschaften*, v. 7, no. 22, pp. 592-593,  
November 1960

Results are presented of laboratory and underground studies concerned with the effect of explosive charge on deformation of pillars due to static and dynamic stress.  
(EI, 1961)

- 2,140. THEORY AND PRACTICE OF INCLINED  
DRILLING FOR SURFACE MINING

Kochanowsky, B. J.

*Pit and Quarry*, v. 53, no. 10, pp. 128-132,  
April 1961

The advantages of inclined drilling to angles of 10 to 40 deg are grouped in 12 points. Better blasting efficiency is achieved because the rate of available explosive energy, utilized for fragmentation, is higher; rock resistance against blasting at the toe of the bench is much smaller; and the part of the borehole which can be loaded with explosives is larger. Examples of application are given.  
(EI, 1961)

- 2,141. LANGLOCHBOHREN UND SCHIESSEN IM  
SIEGERLAENDER ERZBERGBAU  
(DRILLING AND BLASTING DEEP DRILL-  
HOLES IN SIEGERLAND MINES)

Schmoll, G.

*Zeitschrift fuer Erzbergbau und Metallhuetten-  
wesen*, v. 14, no. 9, pp. 433-440, September 1961

The changeover to drilling of deep shotholes to increase amount of broken rock resulted in the use of more

effective explosives and in a change of mining system.  
(EI, 1961)

- 2,142. DEVELOPMENTS IN TACONITE  
BLASTING AT ERIE

Bickel, F. D.

*Mining Congress Journal*, v. 47, pp. 42-46,  
November 1961

- 2,143. INCLINED DRILLING AND BLASTING

Kochanowsky, B. J.

*Mining Congress Journal*, v. 47, pp. 57-62,  
November 1961

- 2,144. HOW TO DETONATE AMMONIUM  
NITRATE UNDERGROUND IN SMALL  
DRILL HOLES

Maurer, W. C., Rinehart, J. S.

*Engineering and Mining Journal*, v. 162,  
pp. 102-103+, November 1961

- 2,145. HOW AMMONIUM NITRATE/FUEL OIL  
IS UNDERMINING THE DYNAMITES  
*Canadian Chemical Processing*, v. 45, pp. 49-50,  
December 1961

- 2,146. PROGRAMMED BLASTING, GRADING  
FOR A DIFFICULT CITY-EDGE PROJECT  
*Roads and Streets*, v. 105, pp. 34-39+,  
January 1962

- 2,147. VERSATILE BLAST HOLE RIG  
*Roads and Streets*, v. 105, pp. 97-98,  
January 1962

- 2,148. UNDERGROUND NUCLEAR EXPLOSIONS  
FOR MINING  
Clausen, C. F.

*Pit and Quarry*, v. 54, pp. 96-99, April 1962

## GENERAL SHAFT SINKING AND MINING MECHANISMS AND EQUIPMENT

- 2,149. AIR-OPERATED CLAMSHELL FOR  
SINKING SMALL SHAFTS

Lower, J. W.

*Mining Engineer*, v. 10, pp. 773-775, July 1958

- 2,150. GORNICTWO SOLI KAMIENNEJ I SOLI  
POTASOWYCH W NIEMIECKIEJ  
REPUBLICE DEMOKRATYCZNEJ (MINING  
OF ROCK SALT AND POTASSIUM SALT  
IN GERMAN DEMOCRATIC REPUBLIC)  
Daniec, A.

*Przeglad Gorniczy*, v. 16, no. 2, pp. 105-108,  
February 1960

A system of mining is described, including the size of the chambers and pillars, underground transportation, and hoisting. The hazards due to gas, flooding, and rock bursts are pointed out. (*EI*, 1961)

- 2,151. LUGOWANIE ZLOZA SOLI W WIELICZCE  
OTWORAMI WIERCONYMI Z WYROBISK  
PODZIEMNYCH (LEACHING OF ROCK  
SALT IN DEPOSIT OF WIELCZKA  
THROUGH BOREHOLES DRILLED FROM  
UNDERGROUND WORKINGS)  
Pieprzyk, L., Radomski, A.

*Przeglad Gorniczy*, v. 16, no. 2, pp. 90-94,  
February 1960

Information is presented on leaching through vertical, inclined, and horizontal boreholes. Data on the output of brine and the salt content in brine are given. (*EI*, 1961)

- 2,152. DER ZEIT- UND KOSTENFAKTOR BEI  
AUSBAU UND UNTERHALTUNG VON  
MAUER- UND TUEBBINGSCHAECHTEN  
(TIME AND COST FACTORS IN CON-  
STRUCTION AND MAINTENANCE OF  
MINE SHAFT LINING OF BRICK OR  
TUBBING)  
Arnold, W.

*Neue Huette*, v. 5, no. 7, pp. 377-383, July 1960

It is concluded that the nature of the rock strata in East German mining districts, as well as the water content, justifies the cost of tubing by time savings. A discussion is given of some alternative modern methods,

including the protection of brick lining by a layer of water-tight plastics. (*EI*, 1961)

- 2,153. VORSHLAEGE FUER MESSVERFAHERN  
ZUR ERFORSCHUNG UND UEBERWACH-  
UNG DES FROSTKOERPERS BEIM  
GEFRIERSCHACHTVERFAHREN (SUG-  
GESTED METHOD OF MEASUREMENT  
FOR STUDY AND CONTROL OF FROZEN  
ZONE DURING SHAFT SINKING)

Pilz, B., von Glass, W.

*Bergbauwissenschaften*, v. 7, no. 19, pp. 495-507,  
October 20, 1960

A static calculation is presented of the frozen zone around a shaft. Information on the formation and behavior of the frozen zone is given. The temperature distribution along the freezing pipe is discussed, as well as the growth of the frozen zone inside and outside of the freezing circle, and the effect of groundwater flow on the formation of the frozen zone. (*EI*, 1961)

- 2,154. 1,106 FEET IN 31 DAYS AT HARTLES  
*South African Institute of Mining and Metal-  
lurgy, Journal of the*, v. 71, no. 3536, pp. 1207,  
1209-1211, November 11, 1960  
(See also *Mining Journal*, v. 255, no. 6539,  
pp. 682-683, December 16, 1960)

No. 4 shaft, Hartebeestfontein G.M., in the Klerksdorp district, has a lined diameter of 24 ft and a planned depth of 7500 ft. When complete, it will be used for handling men and materials and for hoisting ore for the mill, and will provide additional ventilation. A 30-ft<sup>3</sup> capacity mechanical grab and 14-ton kibbles are employed. The pre cementation method, drills and steel used, cleaning and lining, and hoisting are discussed. (*EI*, 1961)

- 2,155. FREEZING SUBSOIL AID TO WORKING  
IN WET GROUND  
Salter, R. J.  
*Heating and Air Conditioning*, v. 25, no. 5,  
pp. 444-445, November 1960

The use of a method, applicable in mines where work is surrounded by a block of frozen ground, which both solidifies loose ground and prevents any flow of water

into work, is described. The ground is frozen by boring a series of vertical holes and lining them with freezing tubes through which brine is passed. Brine cooling is carried out by a refrigerated plant using ammonia. This process solidifies strata and saves on shoring. (EI, 1961)

**2,156. CASE HISTORY: SHAFT SINKING IN HEAVY GROUND**

**Gerwels, R. P.**

*Mining Engineer*, v. 12, no. 12, pp. 1257-1259,  
December 1960

Minas de Matahambre copper mine, located southwest of Havana, has produced 10 million tons of ore since 1913. During the 1950's the mine was producing 1000 tons per day. This mining operation necessitated a deepening of the shaft; heavy ground was encountered which almost closed the project. A geological study resulted in a modification of a three-compartment rectangular shaft to a four-compartment elliptical shaft, solving the problem of pressure. (EI, 1961)

**2,157. SHAFT-SINKING AT FREE SLATE SAAI-PLAAS GOLD MINING COMPANY, LTD.**

**Merrick, G. A., Thompson, M. H.**

In "Association of Mine Managers of South Africa—Papers and Discussions 1958-1959,"  
pp. 1-48

Association of Mine Managers of South Africa,  
Johannesburg, 1960

Two shafts with diameters of 24' and 27' 6", respectively, were sunk to over 6000 ft, using mechanical methods of cleaning and lining. A 20-ft<sup>3</sup> air-operated cactus grab was used in the sinking operations. Planning for sinking was concentrated on hoisting and disposal of the waste, and concreting. Sinking equipment that was utilized, the organization and procedures used in the sinking operations, and the surface layout and plant are discussed. (EI, 1961)

**2,158. DEEPENING OF NO. 1 VERTICAL SHAFT AT PREMIER (TRANSVAAL) DIAMOND MINING COMPANY, LTD.**

**Borchers, D.**

In "Association of Mine Managers of South Africa—Papers and Discussions 1958-1959,"  
pp. 95-109

Association of Mine Managers of South Africa,  
Johannesburg, 1960

The deepening and station-cutting from 1352 to 1902.5 ft below the collar of the shaft serving the mine in full

production are discussed. Details on the shaft duty and schedule prior to the sinking are presented as well as the shaft duty and alternative schedules during the sinking. Isolation of sinking compartments, the hoisting arrangements, the ventilation layout, and the blasting procedure are given consideration. (EI, 1961)

**2,159. SHAFT-SINKING AT LIBANON GOLD MINING COMPANY, LTD., USING MECHANICAL ROCKER SHOVEL**

**Spies, W. A.**

In "Association of Mine Managers of South Africa—Papers and Discussions 1958-1959,"  
pp. 111-128

Association of Mine Managers of South Africa,  
Johannesburg, 1960

Factors taken into account were the size and shape of a shaft which would be required to handle men, rock, and material. High rock temperatures were expected; thus, large volumes of both upcast and downcast air would be required and possible weak ground could be expected. Information is included on surface layout, shaft design, sinking equipment, shaft lining, and mucking operators with a mechanical shovel loader. (EI, 1961)

**2,160. HOW ROTARY DRILLING SPEEDS SHAFT SINKING**

**Ray, F., Atkinson, G. O.**

*Mining World*, v. 23, no. 1, pp. 23-25, 55,  
January 1961

Using conventional oil field rotary drilling machines and drilling practices, four 44-in.-D ventilation shafts were sunk to depths ranging from 668 to 822 ft. The actual drilling time required ranged from 9 to 21 days. Average cost for drilling and hanging the 36-in. casing was \$48.00/ft. A comparison with other methods is made. (EI, 1961)

**2,161. MODERNISATION OF MEADOWBANK SALT MINE**

*The Engineer*, v. 211, no. 5480, pp. 162-163,  
February 3, 1961

At an underground mine in Cheshire, salt is now mechanically handled right from the working faces to the final loading for dispatch. Shortwall chain machines are used to undercut the entire width of the stall face; electric drills, mounted on a self-propelled carriage, are put down 10-ft shot holes in a predetermined pattern above the undercut. The holes are then charged with an

explosive and the face is blasted down. Bottom discharging skips are used to hoist the salt in the shaft. Signaling and indication panels are provided at the surface. (*EI*, 1961)

**2,162. DAS ABTEUFEN DER BEATRIX-SCHAECHTE NACH DEM HONIGMANN-DE-VOOYS-VERFAHREN (SINKING OF BEATRIX SHAFT BY HONIGMANN-DE-VOOYS METHOD)**

Weehuizen, J. M., Voncken, J. A. F.  
*Glueckauf*, v. 97, no. 8, pp. 401-420,  
April 12, 1961

The drilling of a shaft, 7.65 m in diameter and 500 ft deep, using an improved drilling rig, is described. The lining consists of external and internal steel tubes, which are welded together, and the interval between them is filled with concrete. The lining also includes a 25-cm asphalt layer. (*EI*, 1961)

**2,163. HOW TO ANALYZE DEFLECTION OF SLEEVED SHAFTS**

Duggan, T. V.  
*Product Engineering*, v. 32, no. 16, pp. 60-63,  
April 17, 1961

The practical method described is based on what might be called restraint of strain. It offers a reasonably accurate solution with much less effort than the classical method. The principle and application of the restraint of strain, a procedure for obtaining an equivalent shaft, and an example are given. (*EI*, 1961)

**2,164. ROCK SALT MINING OPERATIONS IN MICHIGAN, OHIO, AND ONTARIO**

Bleimeister, W. C.  
*Mining Engineering*, v. 13, no. 5, pp. 467-471,  
May 1961

The greatest salt production in the United States is obtained from the Eastern Basin area. Information is included on the geology of the salt basin, shafts, ventilation, the mining method, drilling, blasting, loading, and haulage. Underground and surface salt preparation is considered. (*EI*, 1961)

**2,165. PRESPLIT BLASTING AT NIAGARA POWER PROJECT**

Paine, R. A., Holmes, D. K., Clark, H. E.  
*Explosives Engineer*, v. 39, no. 3, pp. 71-78,  
82-93, May-June 1961

The details are given of the excavation of twin conduits of a 2190-Mw project, each of which is 46 ft wide, 66 ft high, and can handle 83,000 ft<sup>3</sup> of water per second. Square conduits with arched tops are constructed by a cut and cover method. Drilling and blasting methods are described. The extensive use of "presplitting," which gives a free surface of shear plane in a solid by the controlled usage of explosives, and so prepares a break-line for subsequent blasting and excavation, is discussed. An analysis is given of the effects of presplitting. (*EI*, 1961)

**2,166. BREAKING SHAFT SINKING RECORD**  
*Colliery Engineering*, v. 38, no. 448, pp. 242-246,  
June 1961  
(See also *Modern Refrigeration*, v. 64, no. 761,  
pp. 800-803, August 1961)

Details are given of the equipment and procedures used in sinking 339 ft of the 24-ft-D Kellingley No. 2 shaft, in record time. The main sinking at No. 2 commenced on June 19, 1960, and excavation was down to 2031 ft by April 1, 1961. Refrigeration was used to control the water-bearing strata. Information is included on the drilling and blasting, mucking, temporary support, and walling and concrete preparation. (*EI*, 1961)

**2,167. SCHACHTBAU SOWIE AUS- UND VORRICHTUNG (SHAFT SINKING, INCLUDING EXPLORATION AND PRELIMINARY WORK)**

*Glueckauf*, v. 97, no. 14, pp. 801-836,  
July 5, 1961

The following papers were presented at a conference in Essen, Germany, on March 28, 1961:

"Introduction," by E. Stein, pp. 801-802; "Experience Gained, Achievements, and Costs of Deepening Shaft Using Large Diameter Borehole as Guide," by G. Lange, pp. 802-809; "Successful Driving of Shaft and Sinking of Winzes by Means of Large Diameter Drilling at Friedrich Heinrich Mine," by W. Mueller, pp. 809-819; "New Experience with Driving Roadways Using Machines," by K. Brandi, pp. 819-826; and "Latest Experience With Rotary Bits in Underground Large Diameter Drilling in Ruhr Region," by K. Troesken, pp. 827-836. (*EI*, 1961)

**2,168. DAS ABTEUFEN UND AUSBAUEN DES GEFRIERSCHACHTES AUGUSTE VICTORIA 7 (SINKING AND LINING OF FROZEN SHAFT AUGUSTE VICTORIA 7)**  
Wengel, J., Luetgendorf, H. O., Helfferich, R.

*Glueckauf*, v. 97, no. 22, pp. 1341-1369,  
October 25, 1961

The shaft is 960 m in depth and 6.75 m in diameter. The drilling of freezing boreholes, and freezing and sinking are considered. The introduction of cement between the steel tubing and the shaft wall is discussed. Information is included on the electric logging of the lithological character of a columnar section, the electric control of frozen ground, and the calculation and testing of tubing. (*EI*, 1961)

**2,169. SALT MINING ON HISTORIC  
JEFFERSON ISLAND**

Hughes, J. H., Jr.  
*Explosives Engineer*, v. 39, no. 6, pp. 179-182,  
November-December 1961

A description is given of a 4700-ton-per-day salt mine on Jefferson Island, in a 1000-ft depth. The slope will reach a 1400-ft depth. The room and pillar method of mining is used. The first 6-in. kerf is produced with a Goodman electric undercutter; then two jumbo mounted hydraulically controlled drills make the blast holes. The drill pattern is given, as well as information on the explosives and equipment used. (*EI*, 1961)

**2,170. STRESS DUE TO SPHEROIDAL INCLUSION  
OF MATERIAL HAVING CURVILINEAR  
AEOLOTROPY ON AXIS OF LARGE  
TWISTED ISOTROPIC CYLINDER**  
Bhowmick, S. K.  
*Archiwum Mechaniki Stosowanej*, v. 13, no. 3,  
pp. 321-325, 1961

The problem of stresses in a large cylindrical shaft, calculated by S. C. Das in 1954, is extended to the case when an inclusion has curvilinear anisotropy. (*EI*, 1961)

**2,171. PLASTIC FLOWAGE OF SALT IN MINES  
AT HUTCHINSON AND LYONS, KANSAS**  
Snyder, J. D., Dellwig, L. F.

1961  
Geological Survey, Lawrence, Kansas  
Bulletin 152, Part 2

Pressure, due to an overburden but modified by the percentage of the salt excavated and by the configuration of the excavation, caused plastic flow of salt. Development of the structures was a result of the spreading of the pillars by this plastic flow and of movement along the lubricating-underlying shale layer. The thickness of the salt left in the floor and the rate at which the area was mined determined the size and shape of the structures that developed. (*EI*, 1961)

## MISCELLANEOUS MECHANISMS AND MACHINERY CONSTRUCTION

- 2,172. SLIDE WITH AUTOMATIC REVERSAL  
AND ADJUSTABLE STROKE  
Gould, S. P.  
*Machinery*, v. 62, p. 191, November 1955

- 2,173. SURVEY OF INTERMITTENT-MOTION  
MECHANISMS  
Bogardus, F. J.  
*Machine Design*, v. 28, pp. 124-131,  
September 20, 1956

Reference is made to mechanisms which produce alternate periods of motion and rest, with no reversal of direction in output motion. The possible combinations of motion and various applicable mechanisms are given. A bibliography is included. (*EI*, 1956)

- 2,174. DESIGNING FOR INTERMITTENT  
MOTION WITH MODIFIED STARWHEELS  
Kist, K. E.  
*Machine Design*, v. 28, pp. 100-104,  
October 4, 1956

- 2,175. MODIFIED SCOTCH-YOKE MECHANISM  
FOR ROTARY-TO-LINEAR CONVERSION  
OF MOTION  
*Machine Design*, v. 29, p. 67, October 31, 1957

- 2,176. KNEADING MOTION OF CAM-DRIVEN  
FINGERS TO PRODUCE POSITIVE  
PUMPING ACTION  
*Machine Design*, v. 29, p. 119, November 14, 1957

- 2,177. HARMONIC DRIVE PRINCIPLE  
*Machine Design*, v. 30, p. 100, January 9, 1958

- 2,178. ONE-HALF REVOLUTION, ONE-HALF  
PAUSE MECHANISM; CLUTCH DESIGNED  
TO OPERATE TWO MACHINE HEADS  
USED FOR SIMULTANEOUSLY TWISTING  
EYELETS ON WIRES  
Stewart, R. T.  
*Machinery*, v. 64, pp. 147-148, March 1958

- 2,179. ALTERNATE FOUR-BAR MECHANISMS  
Hall, A. S.  
*Machine Design*, v. 30, pp. 133-135, May 1, 1958

- 2,180. SECOND ACCELERATION IN FOUR-BAR  
MECHANISMS AS RELATED TO  
ROTOPOLE MOTION  
Carter, W. J.  
*ASME, Transactions of the, Series E—Journal  
of Applied Mechanics*, v. 25, pp. 293-294,  
June 1958

- 2,181. NON-LINEAR VIBRATIONS IN  
MECHANICAL SYSTEMS  
Crossley, F. R. E.  
*Engineering*, v. 186, pp. 212-215, August 15, 1958

- 2,182. INTERMITTENT DRIVE WITH  
REVERSE-LOCKING FEATURE  
Decoulos, J. J.  
*Machinery*, v. 64, p. 113, August 1958

- 2,183. BENDING NORMAL PRESS MOVEMENT  
ROUND-THE-CORNER  
Strasser, F.  
*Machinery*, v. 64, pp. 90-93, August 1958

- 2,184. COMPOUND-MOTION MECHANISM  
*Machine Design*, v. 30, p. 110, September 4, 1958

- 2,185. WRIST-ACTION DRIVE CONVERTS  
ROTARY MOTION TO RECIPROCATING  
*Machine Design*, v. 30, pp. 102-103,  
November 27, 1958

- 2,186. ROLLING-SURFACE MECHANISMS  
Morrison, R. A.  
*Machine Design*, v. 30, pp. 119-123,  
December 11, 1958

- 2,187. TWISTED-ROD SCREW DESIGN  
CONVERTS LINEAR TRAVEL OF HY-  
DRAULIC PISTON TO ROTARY MOTION  
*Machine Design*, v. 31, p. 113, January 8, 1959

- 2,188. ROLL CAMS; THEY STOP AND GO ON DEMAND  
Dunk, A. C.  
*Product Engineering*, v. 30, pp. 68-71,  
January 19, 1959
- 2,189. DWELL-LINKAGES IN SPACE  
Hunt, K. H.  
*Engineering*, v. 187, pp. 248-250,  
February 20, 1959
- 2,190. TWENTY CONVERTING MECHANISMS FOR ROTARY-LINEAR MOTION  
Strasser, F.  
*Product Engineering*, v. 30, pp. 64-65,  
March 2, 1959
- 2,191. CYCLOIDAL-CRANK MECHANISMS  
Schmidt, E. H.  
*Machine Design*, v. 31, pp. 111-114,  
April 2, 1959
- 2,192. MAGNETIC COUPLINGS FOR TOTALLY SEALED SYSTEMS  
Oltmann, A.  
In "Proceedings of the Seventh Hot Laboratories and Equipment Conference, Cleveland, Ohio, April 7-9, 1959," pp. 229-231  
American Society of Mechanical Engineers, New York, N.Y.
- A means of transmitting rotary motion into a totally sealed system without the use of stuffing boxes, freeze seals, or rotary mechanical seals is described. (NSA, 1959, #17,613)
- 2,193. CONVERTING ROTARY MOTION FROM CONTINUOUS TO OSCILLATING  
Bossmann, C.  
*Machinery*, v. 65, p. 143, April 1959
- 2,194. STROBE TECHNIQUES ANALYZE COMPLEX MECHANICAL MOTION  
Blakeslee, J. H.  
*Electronics*, v. 32, pp. 62-64, June 5, 1959
- 2,195. STUDY OF MECHANISMS  
M'Ewen, E.  
*The Engineer*, v. 208, p. 151, August 28, 1959
- 2,196. SNAP-ACTION MECHANISMS  
Noy, P. C.  
*Product Engineering*, v. 30, pp. 68-69, August 17, 1959; pp. 44-45, August 31, 1959
- 2,197. SINTEZ PLOSKIKH SHARNIRNO-RYCHAZHNYKH MEKHANIZMOV (SYNTHESIS OF PLANE OF HINGED AND LEVER MECHANISMS)  
Cherkudinov, S. A.  
1959  
Akademii Nauk SSSR, Moscow  
Publication, 322 pp. (Izdatelstvo)
- Problems of the reproduction of a continuous function on a given segment, as they relate to the theory of machines, are discussed. (EI, 1960)
- 2,198. MULTIPLE-PITCH SCREW EQUALIZES DISCHARGE  
Bass, M. S.  
*Chemical Engineering*, v. 67, p. 126,  
January 11, 1960
- 2,199. REMOTE CONTROL DEVICE FOR MACHINERY AND COUPLINGS  
March 16, 1960  
U.S. Department of Commerce,  
Washington, D.C.  
French Patent 1,211,483 (assigned to Gertight Unions, Ltd.)
- Remote-control devices are described enabling the coupling of two elements, each element being provided with a threaded portion so that the coupling can be effected by screwing together these elements. This remote control device comprises a movable support in which a toothed wheel is mounted on a driving axle, positioned parallel to the axis of the element, and may slide along this axle. The axial position of this toothed wheel on the axle is controlled by the action of pneumatic cylinder-piston means, while the said support as a unit may be displaced in a direction perpendicular to the axis of the element by other cylinder-piston means in order to couple the toothed wheel with a toothed ring fixed on one of the said elements, the driving toothed wheel following the axial displacement of this element during its screwing movement. (NSA, 1962, #5451)
- 2,200. MECHANICAL MOVEMENTS; SOME PROBLEMS OF RATIONAL DESIGN  
Hunt, K. H.

*Institution of Engineers, Australia, Electrical and Mechanical Engineering Transactions of the, v. EM 2, no. 1, pp. 13-20, May 1960*

A review is given of the fundamental methods in the design of mechanical movements, with a view to the necessity of solving new problems of automatic manufacture, control, processing, computing, etc. 25 references. (EI, 1960)

- 2,201. **MECHANISATION OF ASSEMBLING AND WELDING OPERATIONS AT ROSTELMASH (ROSTOV-ON-DON AGRICULTURAL MACHINERY PLANT)**  
Solodenko, G. P., Sapov, P. M., Zhavoronko, P. I., Kochka, V. T.  
*Welding Production* (English translation of *Svarochnoe Proizvodstvo*), no. 6, pp. 40-46, June 1960

Automatic equipment is detailed for the welding of a turntable member, of right and left rods of a potato digger, and of screws to shafts. Semi-automatic welding with CO<sub>2</sub> shielding is discussed and consideration given to submerged arc-spot welding, which is widely used. Increased efficiency of resistance welding is noted. (EI, 1961)

- 2,202. **CONTRIBUTION AU CALCUL DES VITESSES CRITIQUES D'UN ARBRE (CALCULATION OF CRITICAL SPEED OF SHAFTS)**  
Tache, J.  
*Bulletin Technique de la Suisse Romande*, v. 86, no. 15, pp. 261-266, July 16, 1960; no. 16, pp. 273-279, July 30, 1960

Analytical, algebraic, and graphical methods of calculation are presented. The replacing of the weight of a shaft of a constant diameter by equal forces, by a single central force, by an eccentric force, or by two symmetrical forces is discussed. Given consideration is the replacing in the case of an overhanging shaft and of a shaft of variable sections. Formulas for the determination of values of replacing forces are included. (EI, 1961)

- 2,203. **THE POSSIBILITY OF USING PLASTIC SOLIDS AS THE WORKING MEDIUM IN HYDRAULIC POWER CYLINDERS**  
Vereshchagin, L. F., Fedorovsky, A. E., Isaikov, V. K., Slesarev, V. N., Semerchan, A. A.  
*Inzhenerno-Fizicheskii Zhurnal*, v. 3, no. 7, pp. 132-134, July 1960 (in Russian)

It is shown experimentally that it is possible to increase the working pressure in the cylinder of a hydraulic press to 10-15 thousand atmospheres by using a plastic solid body instead of a liquid. (AMR, 1961, #2512)

- 2,204. **WIRTSCHAFTLICHKEIT SCHWEISSTECHNISCHER VERFAHREN BEI DER NEUFERTIGUNG UND REPARATUR LANDWIRTSCHAFTLICHER FAHRZEUGE (ECONOMICS OF APPLICATION OF WELDING IN PRODUCTION AND MAINTENANCE OF AGRICULTURAL MACHINES)**  
Wirtz, H.  
*Schweissen und Schneiden*, v. 12, no. 9, pp. 413-415, September 1960

Examples are given of the savings in man hours as compared with other methods of joining. Additional time saving by the farmer through the use of mobile welding service equipment is discussed. (EI, 1961)

- 2,205. **LARGE-OSCILLATION MECHANISMS**  
Aronson, R.  
*Machine Design*, v. 32, no. 23, pp. 190-196, November 10, 1960

Design details and performance characteristics are discussed of the different types of mechanisms that transform rotary input into oscillating output of 180 deg or greater. (EI, 1961)

- 2,206. **MECHANISM DESIGN**  
Goodman, T. P.  
*Machine Design*, v. 32, no. 24, pp. 122-127, November 24, 1960; no. 25, pp. 174-179, December 8, 1960; no. 26, pp. 110-117, December 22, 1960; v. 33, no. 1, pp. 126-133, January 5, 1961

The use of four basic concepts to speed and improve design is considered.

The nature of constrained motion and the constraints necessary to achieve it in a given mechanism are discussed (November 24, 1960). Toggle effect is presented (December 8, 1960). A rotation concept is included (December 22, 1960). The concept of kinematic inversion is discussed (January 5, 1961). 51 references.

- 2,207. KRITISCHE DREHZAHLEN UNTER TORSION UND DRUCK BEI BERUECKSICHTIGUNG DES EIGENGEWICHTES (CRITICAL ANGULAR VELOCITIES UNDER TORSION AND PRESSURE WITH CONSIDERATION OF TRUE SPECIFIC WEIGHT)  
Leipholz, H.  
*Zeitschrift fuer Angewandte Mathematik und Physik*, v. 11, no. 6, pp. 455-471, November 1960

A method is given for solving the problem for continuously loaded shafts. An example is presented which shows that critical angular velocities increase when a shaft carries a continuous load, instead of a single concentrated load of the same magnitude on the ends. (EI, 1961)

- 2,208. REFINEMENT OF FINITE DIFFERENCE CALCULATIONS IN KINEMATIC ANALYSIS  
Shaffer, B. W., Krause, I.  
*ASME, Transactions of the, Series B—Journal of Engineering for Industry*, v. 82, no. 4, pp. 377-381, November 1960

First and second finite difference expressions are derived for the first three derivatives of displacement with respect to time. Numerical results obtained by applying these difference expressions to a specific cam-follower mechanism agree well with the values obtained by successive differentiation of displacement time equation. Procedures are included for evaluating and improving numerical results. (EI, 1961)

- 2,209. PRIMENENIE INTEGRALNYKH URAVNENII V ZADACHE O KRUCHENII VALOV PEREMENNOGO DIAMETRA (APPLICATION OF INTEGRAL EQUATIONS TO PROBLEM OF TORSION OF SHAFTS OF VARIABLE DIAMETER)  
Belonosov, S. M.  
*Prikladnaya Matematika i Mekhanika*, v. 24, no. 6, pp. 1042-1046, November-December 1960 (English translation available in *PMM; Journal of Applied Mathematics and Mechanics*, v. 24, no. 6, pp. 1583-1589, 1960)

Reduction of the boundary problem to an integral equation is discussed, as well as torsion of a cylindrical shaft with peripheral notch. (EI, 1961)

- 2,210. O KRUCHENII TELA VRASHCHENIYA OSESIMMETRICHNOI NAGRUKZKOI (TORSION OF SOLID OF REVOLUTION UNDER AXISYMMETRICAL LOADING)  
Abramyan, B. L.  
*Prikladnaya Matematika i Mekhanika*, v. 24, no. 6, pp. 1047-1056, November-December 1960 (English translation available in *PMM; Journal of Applied Mathematics and Mechanics*, v. 24, no. 6, pp. 1590-1603, 1960)

The problems presented concern cases in which a shaft has the form of a truncated circular cone twisted in one case by a load distributed over part of its lateral surface, and in the other case by concentrated moments also applied to the lateral surface of the shaft. The problem of hollow hemisphere is discussed. (EI, 1961)

- 2,211. WELDED ANGLES MAKE SQUARE TUBES FOR LIGHTER FARM TOOLS  
Brosheer, B. C.  
*American Machinist/Metalworking Manufacturing*, v. 104, no. 25, pp. 104-105, December 12, 1960

Square tubes turned out at speeds up to 41 inches per minute by automatic cleaning and welding machines at Allis-Chalmers, are replacing solid steel bars in some of the more rugged subassemblies for agricultural machines. Low cost, strong, easy-to-ship frames for farm machinery are obtained by this method. (EI, 1961)

- 2,212. OGRANICHITELI KHOLOSTYKH KHODOV METALLOREZHUSHCHIKH STANKOV (LIMITERS FOR IDLE RUNNING OF METAL CUTTING MACHINES AND DRIVES)  
Alekseeva, N. N.  
*Stanki i Instrument*, v. 31, no. 12, pp. 3-6, December 1960 (English translation available in *Machines and Tooling*, v. 31, no. 12, pp. 4-7, 1960)

A discussion is presented of various electromechanical devices which switch off the electric motors when the working elements of the machines are out of action during auxiliary operations (measuring machined components, change of heads, tools, etc.). The saving of electric current consumption is noted. (EI, 1961)

- 2,213. VIBRATION OF RIGID SHAFT ON SHORT SLEEVE BEARINGS  
Holmes, R.

*Journal of Mechanical Engineering Science*,  
v. 2, no. 4, pp. 337-341, December 1960

Stable and unstable vibrational characteristics of rigid shafts, symmetrically supported on short journal bearings, are obtained directly from the Reynolds equation and represented in terms of two parameters. It is suggested that the order of vibrational amplitudes to be expected for shafts of considerable rigidity may be estimated from the results, which also indicate the possibility of oil whirl occurrence. (EI, 1961)

**2,214. BERICHTE VON DER WERKZEUG-MASCHINEN-AUSSTELLUNG HANNOVER 1960 (REPORTS ON 1960 MACHINE TOOL EXHIBIT AT HANNOVER)**

*Draht*, v. 11, no. 12, pp. 739-797, December 1960

Subjects covered at the 1960 machine tool exhibit at Hannover, Germany include:

Machines for Production of Wire, Rope, and Cable, pp. 739-743; Machines for Straightening and Cutting of Wire, Rod, and Tubing, pp. 743-746; Machines for Cold Forging and Extrusion of Mass-produced Parts, Made of Wire, pp. 747-752; Machines for Manufacture of Springs, pp. 753-756; Machines for Wire Processing, pp. 756-758; Machines for Chain Manufacture (Jewelry and for Industrial Use), pp. 758-761; Machines for Fabricating of Strip, Sections, and Tubing, pp. 761-763; Lathes and Screw Cutting Machines, pp. 764-768; Automatic Turret Lathes, pp. 769-771; Long-Turning Automatic Screw Machines, pp. 771-775; Spark Erosion, Electrolytic, and Ultrasonic Metal Cutting Machines, pp. 775-779; Chucks, pp. 779-780; Machines and Apparatus for Surface Treatment (Grinding and Polishing, Cleaning, Protective Coating), pp. 780-781; Tools, p. 781; Materials Testing, pp. 782-783; Measuring Instruments, pp. 784-789; Electric Welding Machines, pp. 790-793; Induction Heating, pp. 793-794; and Electric Control, pp. 795-797. (EI, 1961)

**2,215. SIMPLIFIED METHODS OF DESIGN OF THE SIX-LINK DWELL MECHANISM**

Wetzel, S.  
*Maschinenbautechnik*, v. 9, no. 12, pp. 655-661, December 1960 (in German)

For a six-link mechanism consisting of a four-bar linkage, a floating link attached to a point on the coupler, and an output crank (or rocker) driven by the floating link, straightforward graphical constructions are derived, lead-

ing to an approximate dwell of the output link for up to six prescribed positions of the input crank and permitting, if desired, relatively long periods of approximate dwell. (AMR, 1961, #6107)

**2,216. ZAGADNIENIE ZUPELNOSCI W KLASYFIKACJI STRUKTURALNEJ RUCHOMYCH GRUP (PROBLEM OF COMPLETENESS IN STRUCTURAL CLASSIFICATION OF MOVABLE GROUPS)**

Morecki, A.

*Archiwum Budowy Maszyn*, v. 7, no. 2, pp. 231-242, 1960 (in Polish with English summary)

A general method is presented of exhausting form varieties of movable groups with kinematic pairs of class five for five mechanism families. This proposed method permits a survey of all group varieties and forms and a choice of a suitable mechanism. Two tables of mechanisms are included. (EI, 1961)

**2,217. MECHANISMS; NINE-STEP REFRESHER COURSE**

Hain, K., Schaedler, H., Marx, G.

*Product Engineering*, v. 32, pp. 25-28, January 2, 1961; pp. 62-64, January 9, 1961; pp. 46-47, January 16, 1961; pp. 48-49, January 23, 1961; pp. 36-37, January 30, 1961; pp. 44-46, February 6, 1961; pp. 52-53, February 13, 1961; pp. 80-81, February 20, 1961; pp. 54-56, February 27, 1961 (Also available as combined reprint from Readers Service Department, Product Engineering, New York, N.Y.)

**2,218. KINEMATISCHE ANALYSE VAN VLAKKE MECHANISMEN MET GEDWONGEN BEWEGING (KINEMATIC ANALYSIS OF PLANE MECHANISMS WITH FORCED MOTION)**

Dijksman, E. A.

*Ingenieur*, v. 73, no. 2, pp. W1-13, January 13, 1961

In the first part of the article velocity and acceleration of any point of complex mechanisms in plane motion are determined. A new method is developed for this purpose. In the second part of the article plane motion of any body in a complex mechanism is analyzed. (EI, 1961)

**2,219. MACHINE TOOL RESEARCH, DESIGN, AND UTILIZATION**

Galloway, D. F.

*Machinery*, London, v. 98, no. 2515, pp. 196-204, January 25, 1961  
(See also *The Engineer*, v. 210, no. 5475, pp. 1081-1082, December 30, 1960; *Chartered Mechanical Engineer*, v. 8, no. 2, pp. 72-83, 95, 133, February 1961)

The James Clayton Lecture presented to the Institution of Mechanical Engineers on December 14, 1960 is abstracted. Reference is made to criteria of performance, terminology and specification, the necessity for increased static and dynamic stiffness of the machine tool structure, vibration, automation, and ergonomics. (EI, 1961)

**2,220. FLEXIBLE METAL TAPES FOR HIGH-SPEED MECHANISMS**

Hebeler, C. B.

*Product Engineering*, v. 32, pp. 65-69, February 20, 1961

Havar (a steel alloy) strip is used in the "as-rolled" and in the "aged" condition.

**2,221. TORSIONAL STIFFNESS OF NON-CIRCULAR SHAFTS**

Axelrad, D. R.

*The Engineer*, v. 211, no. 5483, pp. 281-284, February 24, 1961

The use of shafts having cross sections with multi-symmetrical curved boundaries has become significant in machine design. Keyways or splines in circular shaft-hub connections cause a reduction of the strength of couplings. Stress concentration can be reduced or eliminated by using noncircular connections. The main concern is with properties of cross sections based on the shape of an equilateral triangle, which have advantageous mechanical and dynamical properties. (EI, 1961)

**2,222. BALANCING MULTI-BEARING MACHINES**

Parszewski, Z., Grootenhuis, P.

*The Engineer*, v. 211, no. 5483, pp. 285-288, February 24, 1961

A technique is presented for on-site balancing of complex shaft systems, comprising several rotors and bearing pedestals, which requires only simple total displacement measurements at a number of pre-selected points, with-

out regard to phase relationships. The method uses influence coefficients to denote the effect of out-of-balance in one rotor upon the motion at some other point. Coefficients can either be calculated from known details of the machine or determined by experiments as outlined. (EI, 1961)

**2,223. HARMONIC DRIVE**

Musser, C. W.

*Engineering Materials and Design*, v. 4, no. 2, pp. 84-90, February 1961; no. 3, pp. 156-159, March 1961

The basic principles of harmonic drive are discussed (February). Various potential applications are presented, including control drive, reduction drives, timing assembly, indexing table, and valve actuator (March). (EI, 1961)

**2,224. WHEN LINKAGES NEED HARMONIC ANALYSIS**

Freudenstein, F., Mohan, K.

*Product Engineering*, v. 32, no. 10, pp. 47-50, March 6, 1961

A working equation for output angle, programmed on an IBM 650 computer, made it possible to obtain the table presented. Its use makes it easier to perform the harmonic analysis needed for efficient crank-and-rocker mechanisms. (EI, 1961)

**2,225. INVERTED SLIDER-CRANK MECHANISMS**

Bucci, G. A.

*Machine Design*, v. 33, no. 6, pp. 159-161, March 16, 1961

An approximate equation is presented for finding relationships in a system where a rotating crank produces large-amplitude pinion oscillation. (EI, 1961)

**2,226. DIEDESHEIM INDEXING DRUM-TYPE MACHINES**

*Machinery*, London, v. 98, no. 2523, pp. 657-659, March 22, 1961

A German-made machine enables operations to be performed in four stages, in a single automatic cycle, on three sides of components such as T-shaped pipe fittings. It can be supplied with a maximum of twelve heads, for drilling, boring, turning, facing and recessing, tapping, and screw cutting. The design and operation of the machine are presented. (EI, 1961)

2,227. MODERN PRODUCTION METHODS FOR BULK-HANDLING EQUIPMENT

Amtmann, R. J.

*Machinery*, New York, v. 67, no. 7, pp. 98-101, March 1961

(See also *Machinery*, London, v. 99, no. 2538, pp. 17-19, July 5, 1961)

More economical manufacture of bulk material handling machinery is possible through the use of modern methods and machine tools at Hewitt-Robins, Passaic, N.J. The various types of vibrating machinery rely upon a combination of eccentric shafts and counterweights to provide the necessary motions for various specific applications. A changeover from brazed carbide tools to throw-away inserts is discussed. The use of an 80-ton capacity, 30-station turret punch press and idler pulleys for conveyor belts machined in special line is considered. (*EI*, 1961)

2,228. ON BURMEISTER POINTS OF PLANE

Freudenstein, F., Sandor, G. N.

*ASME, Transactions of the, Series E—Journal of Applied Mechanics*, v. 28, no. 1, pp. 41-49, March 1961

The possibilities in a mechanism synthesis derived from a theory for five positions of a plane, utilizing the points of the plane whose corresponding positions lie on a circle, are discussed. The equation is derived for the location of points, and their algebraic and geometric properties are deduced. A digital computer program is derived which uses the parametric form of equation. An analytical form of the Burmester theory is applied to various linkages. 22 references. (*EI*, 1961)

2,229. RASCHET STANOCHNYKH PRIVODOV PRI PERIODICHESKOI NACRUKZE (CALCULATIONS FOR MACHINE DRIVES WITH PERIODIC LOADING)

Vetts, V. L., Dobroslavskii, V. L.

*Stanki i Instrument*, v. 32, no. 3, pp. 20-25, March 1961

(English translation available in *Machines and Tooling*, v. 32, no. 3, pp. 22-28, 1961)

A generalized expression is presented for dynamic characteristics, as established by investigating asynchronous electric motors and d-c shunt-wound motors. The effect of electro-magnetic transfer transition processes in the motor on the dynamics of the machine drive and constant-value reduced (mathematically) the moment of inertia under periodic external loading. (*EI*, 1961)

2,230. NEW LOOK AT ELASTIC-BODY MECHANICS

Musser, C. W.

*Machine Design*, v. 33, no. 8, pp. 150-156, April 13, 1961

Facts are presented about eight neglected concepts that offer practical possibilities in design. (*EI*, 1961)

2,231. FLEXIBLE JOINT FOR STATICALLY INDETERMINATE SHAFT BEARINGS

Muecke, A.

*Handling, Conveying, Automation—International* (English edition of *Foerdern und Heben*) no. 4, pp. 135-137, April 1961

A statically determinate arrangement for the connection of a gear-box shaft with a crane hoisting drum can be achieved by using a flexible joint. Rigid connection results in a statically indeterminate three-point or four-point bearing, requiring very careful alignment to avoid fatigue failure. The proposed joint has relatively small dimensions and is wear resistant. Torque is transmitted by barrel-shaped rollers. (*EI*, 1961)

2,232. LOW-COMPLEXITY MECHANISMS

Hirschhorn, J.

*Product Engineering*, v. 32, no. 19, pp. 26-29, May 8, 1961

A simpler acceleration analysis procedure is given for mechanisms which, when driven in a certain way, lose their complexity and become suitable for this method. An application of approach to the practical problem is shown in examples. (*EI*, 1961)

2,233. LAAKERINJOUTON VARIKUTUS

TAIVUTUSAkselin KRIITTISEEN PYORIMISNOPEUTEEN (EFFECT OF ELASTIC CLAMPING MOMENT AT SUPPORT AND OF ELASTIC DISPLACEMENT OF BEARINGS UPON CRITICAL SPEED OF AXLE)

Wuolijoki, J. R., Lehto, O.

*Teknillinen Aikakauslehti*, v. 51, no. 9, pp. 302-308, May 10, 1961 (in Finnish with English summary)

Formulas are given for the critical speed of the rotation of certain simple axle-and-disk combinations. Tables are included specifying the relationship between the loading case, unit vertical displacement of the shaft, and elastic clamping moments. The results are of practical value since the supporting of the axles in the bearings

never conforms to the ideal case in actual practice. (*EI*, 1961)

**2,234. EXPERIMENTAL STRESS ANALYSIS OF TOOL JOINTS**

Gormley, J. F.

*Journal of Petroleum Technology*, v. 13, no. 5, pp. 496-500, May 1961

Experimental studies were conducted to determine the relationship between the make-up torque of tool joints and the allowable bending moment. Test equipment and procedure are presented as well as an interpretation of the results. Stresses in a tool joint due to bending are linear up to some point, where stress in the tension side of the pin increases in nonlinear manner. This increase of stress raises the likelihood of fatigue failures. (*EI*, 1961)

**2,235. SHAFT WHIRLING AS INFLUENCED BY STIFFNESS ASYMMETRY**

Hull, E. H.

*ASME, Transactions of the, Series B—Journal of Engineering for Industry*, v. 83, no. 2 [paper WA-252], pp. 219-226, May 1961

Whirling was investigated for three cases involving round or flattened shafts in combination with uniform or asymmetric stiffness bearing supports. The type of whirl varies with the combination of asymmetries used. Single and double frequency whirls were noted, both forward and backward with respect to shaft rotation. Studies of the phase angle changes required by the running conditions indicated the reasons for whirl direction and frequency. (*EI*, 1961)

**2,236. DE STANGENVIERZIJDE ALS AANDRIJVINGSMECHANISME VAN BET INWENDIG MALTEZERKRUIS (FOUR-BAR LINKAGE AS DRIVING MECHANISM OF INTERNAL GENEVA WHEEL)**

Dijksman, E. A.

*Ingenieur*, v. 73, no. 24, pp. W87-98, June 16, 1961

The general dimensions of several four-bar mechanisms with symmetrical coupling curves are determined. (*EI*, 1961)

**2,237. L'ÉNERGIE PNEUMATIQUE: LES FUITES ET LES JOINTS (PNEUMATIC POWER: LEAKS AND JOINTS)**

Helbert, F.

*Automatisme*, v. 6, no. 6, pp. 229-237, June 1961

An analysis of leaks is presented. Their origin and manifestations, and the conditions for realization on leakfree joints are noted. The joints described are based on French and foreign patents at the disposal of Compagnie Parisienne d'Outillage pour l'Air Comprimé. (*EI*, 1961)

**2,238. APPLICATION OF CONJUGATE MECHANISMS TO SYNTHESIS OF FOUR-BAR LINKAGES**

Rosenauer, N.

*Australian Journal of Applied Science*, v. 12, no. 2, pp. 158-165, June 1961

The position of a four-bar linkage is completely determined by six parameters. The determination of the motion requires two additional parameters, angular velocity and acceleration of the crank. This shows that eight parameters completely determine the position and motion of a four-bar linkage. (*EI*, 1961)

**2,239. SICHERHEIT IM MASCHINENBAU DURCH PRAEZISIONSKUPPLUNGEN UND UEBERLASTSICHERUNGEN (SAFETY IN MACHINE BUILDING THROUGH PRECISION CLUTCHES AND OVERLOAD PROTECTION)**

Rueggen, W., Stuebner, K.

*Werkstatt und Betrieb*, v. 94, no. 6, pp. 309-318, June 1961

Various safety installations, such as clutches, breaking pins, flexible clutches with safety hooks, fuses, electric and electromagnetic cutouts, speed regulators, etc., are described and illustrated. (*EI*, 1961)

**2,240. STUDY OF STABILITY AT SUPERCRITICAL SPEEDS**

Wolski, H.

*Israel Research Council, Bulletin of the*, v. 10C, no. 1-2, pp. 14-23, June 1961

It is proved that two degrees of freedom are insufficient for obtaining stability of shaft rotating at supercritical speed. The effect of friction and behavior of the shaft in torsion are apparently essential in explaining the phenomenon. (*EI*, 1961)

**2,241. FREEWHEELING DEVICES**

*Engineering Materials and Design*, v. 4, no. 6, pp. 354-360, June 1961; no. 7, pp. 430-438, July 1961

The operating principles of sprag and roller types of freewheel are discussed. A survey of components is available from British suppliers. (EI, 1961)

**2,242. DESIGNING FLEXIBLE BEAM SUSPENSIONS WITH SAFE VIBRATION CHARACTERISTICS**

Frohrrib, D. A.

*Machine Design*, v. 33, no. 14, pp. 134-142, July 6, 1961; no. 15, pp. 162-170, July 20, 1961

Results are presented of a general analysis of dynamics of beam-suspended elements. The results are numerically correlated to indicate the important trends and to permit a rapid selection of design parameters (July 6, 1961). Application of graphic and tabular response data is discussed in the solution of practical design problems (July 20, 1961). (EI, 1961)

**2,243. SPLICED CONCRETE PILES FILL OFFSHORE CONSTRUCTION GAP**

McGhee, E.

*Oil and Gas Journal*, v. 59, no. 28, pp. 96-97, July 10, 1961

The combination of shallow off-shore water and long concrete piles presented a construction problem in erecting a platform. The piles were fabricated in two pieces, short enough to be handled by a small, shallow-draft derrick barge. After driving the first section, the second section is welded atop the first, and then the spliced pile is driven. A steel tip was used to drive through to the sandy foundation. The welding operation is detailed. (EI, 1961)

**2,244. TOOL ASSEMBLY WITH BI-DIRECTIONAL BEARING**

Longhurst, G. E.

July 11, 1961

U.S. Department of Commerce, Washington, D.C.  
U.S. Patent 2,992,048 (assigned to U.S. Atomic Energy Commission)

A two-direction motion bearing which is incorporated in a refueling nuclear fuel element transfer tool assembly is described. A plurality of bi-directional bearing assemblies are fixed equi-distantly about the circumference of the transfer tool assembly to provide the tool assembly with a bearing surface for both axial and rotational motion. Each bi-directional bearing assembly contains a plurality of circumferentially bulged rollers mounted in a unique arrangement which will provide a bearing sur-

face for rotational movement of the tool assembly within a bore. The bi-directional bearing assembly itself is capable of rotational motion, and thus provides for longitudinal movement of the tool assembly. (NSA, 1961, #22,416)

**2,245. V-BELT DESIGN FOR FARM MACHINERY**

Adams, J., Jr.

*Agricultural Engineering*, v. 42, no. 7, pp. 348-349, 353, July 1961

An analytical method is presented to help the designer of farm machinery to predict the performance characteristics of a V-belt drive. The basic principles described apply to all belt drives. The tables, factors, and numerical results apply to V-belt cross-sections HA, HB, HC, HD, HE, and double angle belts of the same cross sections of quality, described by the RMA 1960 standard multiple V-belt horsepower tables. (EI, 1961)

**2,246. MODELS IN MACHINE TOOL DESIGN**

Thornley, R. H.

*Production Engineer*, v. 40, no. 8, pp. 520-541, August 1961

Static and dynamic characteristics of machine tool elements are predicted from geometrically similar models with the aid of model mechanics. Model laws are shown to hold under both bending and torsional forces in static investigations. In a dynamic study of large and small beams and actual machine beds, satisfactory correlation of natural frequencies, as predicted from model theory, was confirmed. (EI, 1961)

**2,247. HOW TO DESIGN ROCKING MECHANISMS**

Hain, K.

*Product Engineering*, v. 32, no. 37, pp. 65-70, September 18, 1961

Graphical method shows how to design "waltzing pairs" that roll without sliding. Family of logarithmic spirals gives the optimum transmission angles. (EI, 1961)

**2,248. APPLICATION OF RESEARCH RESULTS IN MACHINE TOOL DESIGN AND DEVELOPMENT**

Birchall, T. M., Lewis, F. A., New, R. W.

*International Journal of Machine Tool Design and Research*, v. 1, no. 1-2, pp. 110-147, September 1961

Techniques used by research workers in the development of new machines and the improvement of existing designs are presented. A dynamic analogy of the lathe is shown. The inherent damping characteristics of the machine tool element are considered. Friction and lubrication of slideways are studied to determine those combinations of materials, surface condition, and lubrication conditions which will provide smooth sliding and a near constant of predictable friction forces. Automation is discussed. (*EI*, 1961)

**2,249. FIVE-BAR LOOP SYNTHESIS**

Rose, S. E.

*Machine Design*, v. 33, no. 21, pp. 189-195,  
October 12, 1961

The five-bar loop can be synthesized into mechanisms to generate the prescribed motions. The examples given concern straight line motion and contracting six given points. Dwell mechanisms are discussed. (*EI*, 1961)

**2,250. CONSTRUCTING ACCELERATION DIAGRAMS FOR SPACE MECHANISMS**

Wood, W. G.

*Machine Design*, v. 33, no. 24, pp. 122-125,  
November 23, 1961

Velocities and accelerations of three-dimensional mechanisms may be found by the same graphic methods as those used for analyzing motion in plane mechanisms. (*EI*, 1961)

**2,251. EIGHT BASIC PUSH-PULL LINKAGES [DRAWINGS WITH TEXT]**

Wood, F. W., Jr.

*Product Engineering*, v. 32, pp. 56-57,  
November 27, 1961

**2,252. CAMS IN CONTROL SYSTEMS**

Rothbart, H. A.

*Control Engineering*, v. 8, pp. 97-101,  
November 1961

**2,253. METER-OUT AIR CIRCUIT TIMES BENDING PRESS**

*Hydraulics and Pneumatics*, v. 14, p. 83,  
November 1961

**2,254. CRITICAL SPEEDS OF VERTICALLY SUSPENDED SHAFTS**

Primak, A., Nunlist, E. J.

*Machine Design*, v. 33, pp. 104-111, December 21, 1961; v. 34, pp. 124-130, January 4, 1962; pp. 163-167, January 18, 1962

**2,255. SURPLUS PARTS PLUS INGENUITY YIELD FLEXIBLE MACHINE TOOL; SPHEROMATIC**

Berry, H. A.

*Iron Age*, v. 188, pp. 46-47, December 28, 1961

**2,256. FLUID BEARINGS FOR STRIP PROCESSING LINES**

*The Engineer*, v. 212, p. 1093,  
December 29, 1961

**2,257. WHEN AND HOW FLEXIBLE RUBBER CONNECTORS CAN HELP REDUCE SYSTEM NOISE, VIBRATION**

Swenson, R. L.

*Heating, Piping, and Air Conditioning*, v. 33, pp. 118-122, December 1961

**2,258. ZUR RECHNERISCHEN ERMITTlung DER ABMESSUNGEN VON EBENEN GELENKGETRIEBEN (MATHEMATICAL TREATMENT OF MEASUREMENTS OF PLANE LINKAGE MECHANISMS)**

Luck, K.

*Wissenschaftliche Zeitschrift der Technische Hochschule bei Dresden*, v. 10, no. 1, pp. 109-122, 1961

The method is based on L. Burmester's theory. A general analysis is presented. Equations are included for the determination of centers and angles of rotation, and of relative centers and angles of rotation, etc. 30 references. (*EI*, 1961)

**2,259. DIE BEHANDLUNG VON GETRIEBEN FUER AUSETZENDE BEWEGUNG NACH KINEMATISCHEN UND DYNAMISCHEN GEISCHTSPUNKTEN (TREATMENT OF MECHANISMS FOR SETTING UP MOTION ACCORDING TO KINEMATIC AND DYNAMIC ASPECTS)**

Altschul, R.

*Wissenschaftliche Zeitschrift der Technische Hochschule bei Dresden*, v. 10, no. 1, pp. 123-129, 1961

The possibility is shown of obtaining a large number of variants of mechanisms to influence motion characteristics. (*EI*, 1961)

- 2,260. DIE KNICKUNG DER TORDIERTEN WELLE MIT EINZELKRAFT UND KONTINUERLICHEN LAENGSKRAFT (BUCKLING OF TORSIONALLY STRESSED SHAFT UNDER SINGLE FORCE AND CONTINUOUS LONGITUDINAL FORCE)  
Leipholtz, H.  
*Ingenieur-Archiv*, v. 30, no. 1, pp. 42-56, 1961;  
no. 4, p. 292, 1961

A derivation on the basis of static equilibria, and a solution, of differential equations for the problem of a "long, thin" beam, stressed along the axis by unidirectional compressive stresses, by an equal-direction single force, and by an axial torsional moment acting on the ends of the beam, are presented. The torsion is stipulated to be conservative. (*EI*, 1961)

- 2,261. FIVE-BAR LINKAGES WITH TWO DRIVE CRANKS  
Pollitt, E. P.  
*Machine Design*, v. 34, pp. 168-179,  
January 18, 1962

- 2,262. MECHANICAL OR HYDRAULIC FEED; SUDDEN INTEREST IN LEAD SCREW UNITS STIRS CONTROVERSY  
Eshelman, R. H.  
*Iron Age*, v. 189, p. 85, January 25, 1962

- 2,263. DIAGRAMMING MOTION AND CONTROL SEQUENCES TO SIMPLIFY MACHINE TROUBLESHOOTING  
Craig, J. E.  
*Automation*, v. 9, pp. 80-86, January 1962

- 2,264. FLEXIBLE COUPLINGS AND THEIR MAINTENANCE  
Koenig, E. F.  
*Machinery*, v. 68, pp. 111-123, January 1962;  
pp. 125-132, February 1962

- 2,265. DRIVE CONVERSION PAYS OFF  
*Mill and Factory*, v. 70, p. 21, January 1962

- 2,266. RESURFACING CUTS REPLACEMENT COSTS 75 PER CENT; REPAIR A RAM WITH A SUBMERGED ARC-WELDING UNIT

*Steel*, v. 150, p. 117, February 12, 1962

- 2,267. IMPROVEMENTS IN OR RELATING TO MAGNETIC COUPLINGS  
February 14, 1962  
U.S. Department of Commerce, Washington, D.C.  
British Patent 889,477 (assigned to Commissariat a l'Energie Atomique)

A device for transmitting mechanical motions through a plane wall by magnetic coupling is designed which has a coupling strength superior to those of other known couplings. The device comprises two identical assemblies, one on each side of the wall, each assembly comprising a horseshoe-shaped magnet and a soft iron member secured to the magnet in a direction perpendicular to the magnet pole axis. The device is arranged so that the magnetic field of each magnet passes through the wall and completes its circuit through the soft iron member secured to the other magnet. (*NSA*, 1962, #10,138)

- 2,268. LINKING STANDARD MACHINES  
*Engineering*, v. 193, p. 285, February 23, 1962

- 2,269. VARIETY OF MOTIONS GENERATED BY MECHANISMS  
Freudenstein, F.  
*ASME, Transactions of the, Series B—Journal of Engineering for Industry*, v. 84, pp. 156-160, February 1962

- 2,270. MECHANICAL INTERLOCKS [DRAWINGS WITH TEXT]  
Kasper, L.  
*Machine Design*, v. 34, pp. 135-138,  
March 1, 1962

- 2,271. CONICAL DIES SPEED SETUP ON HYDRAULIC TUBE BENDER  
*Steel*, v. 150, p. 174, March 26, 1962

- 2,272. DETERMINING THE DIMENSIONS OF A SIMPLE LINKAGE  
Bliss, S. C.  
*Machinery*, v. 68, pp. 92-93, March 1962

- 2,273. CONSIDER CAM FEEDS FOR INCREASING PRESS SPEEDS  
Neklutin, C. N.  
*Automation*, v. 9, pp. 61-63, March 1962
- 2,274. SEE-SAW CAM MOTION SMOOTHLY CONVERTS ROTARY TO LINEAR MOTION  
Ball, R. C., Jr.  
*Product Engineering*, v. 33, pp. 68-73, April 2, 1962
- 2,275. WAYS TO AMPLIFY MECHANICAL MOVEMENTS [DRAWINGS WITH TEXT]  
Strasser, F.  
*Product Engineering*, v. 33, pp. 56-57, April 16, 1962
- 2,276. FLAME WITH A PAST BUILDS FOR THE FUTURE: OXYACETYLENE APPARATUS  
Strutz, C. R.  
*Welding Journal*, v. 41, pp. 338-339, April 1962
- 2,277. CYCLING MECHANISMS [ILLUSTRATIONS WITH TEXT]  
Kasper, L.  
*Machine Design*, v. 34, pp. 146-148, May 10, 1962
- 2,278. DESIGNING LOAD-COMPENSATED FAST-RESPONSE HYDRAULIC SERVOS  
Viersma, T. J.  
*Control Engineering*, v. 9, pp. 111-114, May 1962

## REMOTE, AUTOMATIC, AND ADAPTIVE CONTROL

### 2,279. REMOTE CONTROL EQUIPMENT FOR AMPHIBIOUS TRACTORS

Snodgrass, F. E.

September 1950

California, University of, Institute of Engineering Research, Berkeley, Calif.

TR 155-34, Series 29, Issue 34

Automatic control equipment, adapted for remotely steering and operating amphibious tractors, was tested in an armored-type LVT(A5) and an open cargo-type LVT(3). The LVT(A5) installation proved impractical. The LVT (3) equipment appeared satisfactory but required modification. Modified equipment in a covered cargo-type LVT(3M) provided satisfactory radio-controlled operation of the LVT on land and in the surf zone, although difficulties were encountered in supplying power to the equipment. The remote-control equipment is described in detail.

### 2,280. ELECTRONICS AND ALLIED TIMING DEVICES IN INDUSTRY

Huggins, P.

AIEE, *Transactions of the, Part I—Communication and Electronics*, v. 2, no. 1, pp. 40-46, January 1955

This report describes features of available equipment for measuring or controlling time intervals in industrial processes. Advantages of electronic over conventional devices are noted. A short-term microsecond time measurement can be made by electronic chronometers. Sequential and nonlinear timers are described, and a process timer as applied to welding mentioned. Representative British electronic and allied timing devices are listed. (EI, 1955)

### 2,281. REMOTE CONTROL ELECTRONIC EQUIPMENT

Army Electronic Proving Ground,  
Fort Huachuca, Ariz.

March 15, 1955

Final Report for AEPG Task D11C1,  
Report AEPG-SIG-950-4  
AD-59,933

### 2,282. DESIGN OF AUTOMATIC TIME AND SEQUENCE CONTROL SYSTEMS FOR PROCESSES

Gollin, N. W.

ISA Journal, v. 2, no. 4, pp. 102-106, April 1955; no. 5, pp. 150-153, May 1955; no. 6, pp. 199-202, June 1955

Electrical circuits that are required in the design of a coordinated control system are described. The circuits are presented according to their performance characteristics in the control system, rather than their application to a specific machine or process for which they are unique. Schematic diagrams are included. The starting circuits are presented (April 1955). Repeating cycles and other systems are considered (May 1955). Information is included on storage circuits, operation checking circuits, and emergency stops (June 1955). (EI, 1955)

### 2,283. SYNCHRO TIMER AND ITS APPLICATIONS TO MATERIAL HANDLING AND SORTING OPERATIONS

Burgoyne, A. S.

ISA Journal, v. 2, no. 5, pp. 145-149, May 1955

The possibilities are discussed of a unique, accurate instrument for use in difficult timing and sorting operations, and useful as an auxiliary tool to gaging operations. The device functions as a remote control, delayed action relay for controlling the distribution on a conveying line, or as a sorting mechanism in synchronized relation to the movement of the processing line. Acceleration, deceleration, or even stopping does not affect the accuracy of the device. (EI, 1955)

### 2,284. ANALYTICAL METHOD FOR DESIGN OF RELAY SERVOMECHANISMS

Hart, J. E.

AIEE, *Transactions of the, Part II—Applications and Industry*, v. 74, no. 18, pp. 83-89; (discussion) pp. 89-90, May 1955

A method of design is based on derived analytical expressions of deadbeat criteria. Parameters considered are inertia, viscous damping, motor torque, gear ratio, coulomb friction, dynamic braking, external braking, relay sensitivity, relay hysteresis, relay transient time, velocity

feedback coefficient, and velocity squared feedback coefficient. (EI, 1955)

**2,285. ELECTRONIC FACILITIES CONTROL**

De Matteis, J. J.

*Electrical Engineering*, v. 74, no. 8,  
pp. 650-654, August 1955

A central control system is described which follows pre-set programs and automatically switches on or off up to 40 groups of remote operations, each on its own time schedule. Utilizing carrier current signals, it operates over existing electric circuits and does not require installation of any transmission wiring. (EI, 1955)

**2,286. OPTIMIZED PLANT PROCESS CONTROL**

NEARS REALITY

Silvertooth, E. W.

*Control Engineering*, v. 2, no. 9, pp. 123-126,  
September 1955

**2,287. SERVOS THAT USE LOGIC**

CAN OPTIMIZE

Cosgriff, R. L.

*Control Engineering*, v. 2, no. 9, pp. 133-135,  
September 1955

**2,288. STABILITY CRITERIA FOR ELECTRICAL  
OR MECHANICAL SYSTEM WITH  
DISTRIBUTED PARAMETERS**

Gladwin, A. S.

*British Journal of Applied Physics*, v. 6, no. 11,  
pp. 400-402, November 1955

An equation is presented relating to systems with distributed parameters or with an element producing a finite time delay. For the system to be stable, all roots of the equation must be negative or have negative real parts. The relationship among terms involving critical values is given. These criteria are applied to determine the stability of a simple servomechanism in which the correction signal is delayed by a constant period. (EI, 1956)

**2,289. AN ADAPTIVE SERVO SYSTEM**

Benner, A. H., Drenick, R.

*1955 IRE National Convention Record, Part 4—  
Computers, Information Theory,  
and Automatic Control*, pp. 8-14, 1955

**2,290. PROCESS CONTROL AND AUTOMATION**

Williams, T. J.

*Industrial and Engineering Chemistry*, v. 48,  
pp. 622-632, March 1956; v. 49, pp. 554-564,  
March 1957; v. 50, pp. 520-524, March 1958;  
v. 51, pp. 432-436, March 1959; v. 52,  
pp. 183-184, February 1960  
(See also Special Publication, *Industry and  
Engineering Chemistry*, February 1960;  
*Industry and Engineering Chemistry*, v. 53,  
pp. 166-168, February 1961; Special Publication,  
*Industrial and Engineering Chemistry*,  
February 1961)

**2,291. ZUR BEURTEILUNG VON REGELVOR-**

**GAENGEN MIT HILFE DER ZEITSTOSS-  
UEBERGANGSFUNKTION (ESTIMATION  
OF CONTROL PROCESSES WITH AID  
OF TIME-IMPULSE TRANSITION  
FUNCTION)**

Ferner, V.

*Technik*, v. 11, no. 4, pp. 301-308, April 1956

A new method is presented for the approximate determination of the optimum degree of controllability, according to which impulse time would correspond approximately to the dead time of a system. A new impulse function is here termed "time impulse function," and transition function following time impulse is termed "time impulse transition function." (EI, 1956)

**2,292. A SELF-ADJUSTING CONTROL SYSTEM**

Bairnsfather, R. B.

June 1956

Massachusetts Institute of Technology,  
Instrumentation Lab., Cambridge  
Report T-102, AF 33(616)2698  
AD-115,546

A self-adjusting procedure is considered for application to a control system with gaussian random inputs and subject to limiting. The feed-back system is capable of adjusting its own compensation, by using an external computer, in accordance with the minimization of the system mean-square error. This adjustment provides partial compensation for variations in the controlled component parameters and in the input statistics. The adjustment procedures are applicable to linear systems of order greater than two. The procedures do not give much reduction in error in the presence of limiting. Second- and third-order controlled components were considered for which the compensation was selected on

the basis of transient response. A third-order controlled component was considered for which the compensation was determined by root locus. Data for the three cases are appended.

- 2,293. APPLICATION OF AN ADAPTIVE CONTROL SYSTEM TO AN AIRCRAFT WITH A FIXED-GAIN AUTOPILOT  
Early, J. W., Doody, B. J.  
August 1956  
Wright Air Development Center, Wright-Patterson AFB, Ohio  
WADC TN 56-334  
AD-97,159

- 2,294. SAMONASTRAVAIUSSCHIESIIA SISTEMY AVTOMTICHESKOGO REGULIROVANIIA (SELF-ADJUSTING AUTOMATIC CONTROL SYSTEMS)  
Ivakhnenko, A. G.  
1956  
Akademii Nauk Ukrainskii SSR, Kiev  
Publication (Izadatelstvo)

- 2,295. PROBLEMS OF EXTREMAL CONTROL  
Ivakhnenko, A. G.  
*Avtomatyka [Viddil Tekhnichnykh Nauk of Akademiiia USSR, Kiev]*, no. 3,  
pp. 105+, 1956 (in Russian)

- 2,296. USE OF AN ADAPTIVE SERVO TO OBTAIN OPTIMUM AIRPLANE RESPONSE  
Campbell, G.  
February 1957  
Cornell Aeronautical Laboratory, Inc.,  
Buffalo, N.Y.  
Report CAL-84

- 2,297. A METHOD OF DETERMINING THE OPTIMUM CHARACTERISTICS OF ONE CLASS OF SELF-ADAPTING SYSTEMS  
Batkov, A. M., Solodnikov, V. V.  
*Automation and Remote Control*, v. 18, no. 5,  
pp. 411-427, printed 1958  
(English translation of *Avtomatika i Telemechanika*, v. 18, no. 5, pp. 377-391, May 1957)

- 2,298. TITLES OF SOVIET AND FOREIGN PAPERS ON AUTOMATIC CONTROL AND RELATED TOPICS IN 1955

*Automation and Remote Control*, v. 18, no. 5,  
pp. 519-537, printed 1958  
(English translation of *Avtomatika i Telemechanika*, v. 18, no. 5, pp. 474-496, May 1957)

- 2,299. TELEOLOGICAL CONTROL—IT LEARNS BY DOING  
Kerstukos, A. J.  
*Westinghouse Engineer*, v. 17, no. 5, p. 138,  
September 1957

- 2,300. SOME PROBLEMS ON THE THEORY OF DISCRETE AUTOMATIC SYSTEMS  
Tsyplkin, J. Z.  
In "Proceedings of the Computers In Control Systems Conference, Atlantic City, N.J., October 16-18, 1957," p. 11  
American Institute of Electrical Engineers,  
New York, N.Y., May 1958

- 2,301. ADAPTIVE SERVOMECHANISMS  
Drenick, R. F., Shahbender, R. A.  
*AIEE, Transactions of the, Part II—Applications and Industry*, no. 33, pp. 286-292  
November 1957

- 2,302. ELEKTRICHESKIE MIKROMASHINY AVTOMATICHESKIKH USTROYSTV (ELECTRIC MICROMACHINERY OF AUTOMATION SYSTEM)  
Chechet, Yu. S.  
State Publishing House on Power Engineering Literature, Moscow—Leningrad, 1957  
(Translation available as NP-tr-454, Technical Information Service Extension, U.S. Atomic Energy Commission, Rockville, Md.)

A description is given of the basic types of electric micromachines for automatic devices, namely, servomotors, tachometer generators, rotary transformers, and synchro-tie machines. Theory and practical applications in automation circuits are discussed. (NSA 1960, #16,819)

- 2,303. ANALYTICAL DESIGN OF LINEAR FEEDBACK CONTROLS  
Newton, G. C., Jr., Gould, L. A., Kaiser, J. F.  
John Wiley and Sons, Inc., New York, N.Y., 1957  
(Second Edition, 1961)

- 2,304. ON COMMUNICATION PROCESSES INVOLVING LEARNING AND RANDOM DURATION  
Bellman, R. E., Kalaba, R.  
January 23, 1958  
Rand Corporation, Santa Monica, Calif.  
P-1194  
(See also 1958 IRE National Convention Record, Part 4—Automatic Control, Electronic Computers, and Information Theory, pp. 16–21, 1958)
- This report treats the aspects of communication problems involving the use of a channel whose statistical properties are not completely known, and those involving processes of random duration. Application of the functional equation technique to the problems arising from incomplete information is illustrated.
- 2,305. BASIC CHARACTERISTICS OF MEASURING SYSTEMS  
*Instrumentation*, v. 11, no. 1, pp. 21–25,  
January–February 1958
- Measuring devices as part of automatic control systems are discussed, including accuracy of response, lag problem, response of primary elements, radiation elements, transmission lags, effects of walls, static and dynamic errors, dead zone and dead time. (EI, 1958)
- 2,306. DESIGN OF A SELF-OPTIMIZING CONTROL SYSTEM  
Kalman, R. E.  
*ASME, Transactions of the*, v. 80 [paper 57-IRD-12], pp. 468–478, February 1958
- 2,307. OPTIMIZING CONTROL SYSTEMS  
Cosgriff, R. L., Emerling, R. A.  
*AIEE, Transactions of the, Part II—Applications and Industry*, no. 35,  
pp. 13–16, March 1958
- 2,308. COMPENSATING SATURATION IN FEEDBACK CONTROL SYSTEMS BY EXCESS ERROR STORAGE  
Chang, S. S. L., Archibald, R. W.  
*AIEE, Transactions of the, Part II—Applications and Industry*, no. 35,  
pp. 16–20, March 1958

- 2,309. CONTINUOUS MEASUREMENT OF CHARACTERISTICS OF SYSTEMS WITH RANDOM INPUTS: A STEP TOWARD SELF-OPTIMIZING CONTROL  
Goodman, T. P., Hillsley, R. H.  
April 1958  
American Society of Mechanical Engineers, New York, N.Y.  
ASME Paper 58-IRD-5  
(Paper presented at the Fourth IRD Conference, University of Delaware, Newark, April 2–4, 1958)
- 2,310. ON A CERTAIN PRINCIPLE DESIGNING THE SIMPLEST SELF-ADAPTIVE CONTROL SYSTEM  
Rotach, V. Ia.  
*Nauchnye Doklady Vysshei Shkoly, Elektromekhanika i Avtomatika*, v. 1, p. 199,  
April 1958 (in Russian)
- 2,311. AN APPROACH TO NONLINEAR ADAPTIVE CONTROL  
Taylor, C. F.  
April 1958  
Instrument Society of America, Pittsburgh, Pa.  
ISA Paper FCS-1-58  
(Paper presented at the Fourth IRD Conference, University of Delaware, Newark, April 2–4, 1958)
- 2,312. AN ADAPTIVE HUMIDITY CONTROL SYSTEM  
Tucker, G. K.  
April 1958  
American Society of Mechanical Engineers, New York, N.Y.  
ASME Paper 58-IRD-1  
(Paper presented at the Fourth IRD Conference, University of Delaware, Newark, April 2–4, 1958)
- 2,313. THEORY OF A PARAMETER-PERTURBATION ADAPTIVE AND OPTIMIZING CONTROL SYSTEMS  
Rajarman, V.  
June 1958  
Wisconsin, University of, Madison  
Thesis
- 2,314. THE ROLE OF COMPUTERS IN ANALYSIS AND DESIGN OF CONTROL SYSTEMS  
West, G. P.

- IRE Transactions on Automatic Control*,  
v. PGAC-5, pp. 65-66, July 1958
- 2,315. PROBLEMS OF NONLINEARITY IN  
ADAPTIVE OR SELF-OPTIMIZING  
SYSTEMS  
Taylor, C. F.  
*IRE Transactions on Automatic Control*,  
v. PGAC-5, pp. 66-72, July 1958
- 2,316. AUTOMATIC OPTIMALIZER  
Feldbaum, A. A.  
*Automation and Remote Control*, v. 19, no. 8,  
pp. 718-728, printed 1959  
(English translation of *Avtomatika i Teleme-  
khanika*, v. 19, no. 8, pp. 731-743,  
August 1958)
- 2,317. TWIN-CHANNEL AUTOMATIC  
OPTIMALIZER  
Stakhoviski, R. I.  
*Automation and Remote Control*, v. 19, no. 8,  
pp. 729-740, printed 1959  
(English translation of *Avtomatika i Teleme-  
khanika*, v. 19, no. 8, pp. 744-756,  
August 1958)
- 2,318. EXECUTIVE-CONTROLLED ADAPTIVE  
SYSTEMS  
Staffin, R., Truxal, J. G.  
September 9, 1958  
Brooklyn, Polytechnic Institute of, Microwave  
Research Institute, N.Y.  
Research Report 688-58, PIB-616,  
DA-30-069-ORD-1560
- The self-adjusting compensator is a computer which is functionally divided into three major sections: (1) the plant observer, which is responsible for continually determining the characteristics of the process; (2) the executive-controller, which is responsible for supplying the system performance specification; and (3) the actuator, the function of which is to generate the process control signal from information contained in the other two types.
- 2,319. PROGRAMMER FOR MECHANICAL ARM  
Graham, J. M.  
*Control Engineering*, v. 5, no. 9, p. 180,  
September 1958  
(See also other papers included in "Program  
Control Applied," *Control Engineering*,  
v. 5, no. 9, pp. 163-182, September 1958)
- 2,320. CONTROL BASED ON THE PRINCIPLE  
OF A SELF-ADJUSTING PROGRAM  
Perelman, I. I.  
*Automation and Remote Control*, v. 19, no. 9,  
pp. 797-807, printed 1959  
(English translation of *Avtomatika i Teleme-  
khanika*, v. 19, no. 9, pp. 813-823,  
September 1958)
- 2,321. DESIGN OF MODEL-REFERENCE  
ADAPTIVE CONTROL SYSTEMS  
FOR AIRCRAFT  
Whitaker, H. P., Yamron, J., Kezer, A.  
September 1958  
Massachusetts Institute of Technology,  
Instrumentation Lab., Cambridge  
Report 164
- 2,322. ON THE MEASUREMENT PROBLEM IN  
ADAPTIVE SYSTEMS UTILIZING ANALOG  
COMPUTER TECHNIQUES  
Corbin, R. M., Mishkin, E.  
December 23, 1958  
Brooklyn, Polytechnic Institute of, Microwave  
Research Institute, N.Y.  
Research Report 699-58, PIB-627,  
DA-30-069-ORD-1560  
AD-211,356
- Open-loop parameters are measured in a unity feedback control system in which the analog computer is utilized in measurement and control. The controlled process is assumed to have a fixed structure with variable parameters; i.e., it can be represented by a constant number of poles and zeros, which although they occupy positions in the S-plane, may vary with time. All responses are presented as a comparison of theoretical and measured quantities. Generalization of the measurement and control process is made with the analysis of an *n*th order system. The necessary expressions are derived and the measurement portion of the adaptive system is designed.
- 2,323. A SURVEY OF ADAPTIVE CONTROL  
SYSTEMS  
Aseltine, J. A., Mancini, A. R., Sarture, C. W.  
*IRE Transactions on Automatic Control*,  
v. PGAC-6, pp. 102-108, December 1958  
(Also available as IRE Paper PGAC-101,  
presented at the Fourth IRD Conference,  
University of Delaware, Newark, April 2-4, 1958)

- 2,324. STABILITÉ D'UNE INSTALLATION SOUMISE AU RÉGLAGE AUTOMATIQUE (STABILITY OF EQUIPMENT UNDER AUTOMATIC CONTROL)  
Dubois-Violette, P. L.  
*Onde Electrique*, v. 38, no. 381,  
pp. 819-829, December 1958

A method is developed which may be applied to the study of control systems involving appreciable propagation time, and those introducing continuous transmission effect by heat flow or diffusion. (*EI*, 1959)

- 2,325. ANALIZ KACHESTVA I SINTEZ SISTEM AVTOMATICHESKOGO REGULIRAVANIYA S ZAPAZDYVANIEM (QUALITY CONTROL AND SYNTHESIS OF AUTOMATIC CONTROL SYSTEMS WITH LAGS)  
Chung-Vui, F.  
*Avtomatika i Telemekhanika*, v. 19, no. 3,  
pp. 197-207, 1958

An extension of the principles of synthesis of corrective devices of servosystems to control systems with lags is presented. Curves are given to synthesize the systems with lags and to analyze their quality. Circle diagrams are included for the determination of the function of distortion of a material frequency characteristic at various time lags. (*EI*, 1958)

- 2,326. ON THE DESIGN OF ADAPTIVE SYSTEMS  
Groginsky, H.  
*1958 IRE National Convention Record, Part 4—Automatic Control, Electronic Computers, and Information Theory*, pp. 160-167, 1958

- 2,327. A SELF-ADJUSTING SYSTEM FOR OPTIMUM DYNAMIC PERFORMANCE  
Anderson, G. W., Aseltine, J. A.,  
Mancini, A. R., Sarture, C. W.  
*1958 IRE National Convention Record, Part 4—Automatic Control, Electronic Computers, and Information Theory*, pp. 182-190, 1958

- 2,328. CYBERNETIC SYSTEMS OF AUTOMATIC CONTROL  
Ivakhnenko, A. G.  
*Avtomatyka [Viddil Tekhnichnykh Nauk of Akademiiia USSR, Kiev]*, no. 2,  
pp. 47+, 1958 (in Russian)

- 2,329. GENERAL SYNTHESIS PROCEDURE FOR COMPUTER CONTROL OF SINGLE LOOP AND MULTILOOP LINEAR SYSTEMS  
Kalman, R. E., Bertram, J. E.  
*AIEE, Transactions of the, Part II—Applications and Industry*,  
no. 40, pp. 602-609, January 1959

- 2,330. OPTIMAL CONTROL OF CHEMICAL AND PETROLEUM PROCESSES  
Kalman, R. E., Lapidus, L., Shapiro, E.  
January 1959  
International Business Machines Corporation,  
New York, N.Y.  
Research Report RE-76  
(Paper presented at the Joint Symposium on Instrumentation and Computation in Process Development and Plant Design,  
London, England)

- 2,331. CONFERENCE ON THE THEORY AND APPLICATION OF DISCRETE AUTOMATIC CONTROL SYSTEMS  
Morosanov, I. S., Chinaev, P. I., Editors  
*Automation and Remote Control*, v. 20, no. 1,  
pp. 94-102, printed 1959  
(English translation of *Avtomatika i Telemekhanika*, v. 20, no. 1, pp. 100-106, January 1959)

- 2,332. SELF-OPTIMIZING CONTROL SYSTEMS FOR A CERTAIN CLASS OF RANDOMLY VARYING INPUTS  
Roberts, A. P.  
January 1959  
Royal Aircraft Establishment, Farnborough,  
Great Britain  
TN-G.W. 507

Methods are proposed for designing systems which will automatically adjust the parameters to optimum values when the message and noise mean square levels change slowly or infrequently. Methods are also suggested for constraining some quantity such as the output acceleration to a desired mean square value. The simulation of simple examples is described.

- 2,333. A DYNAMIC PROGRAMMING APPROACH TO ADAPTIVE CONTROL PROCESSES  
Freimer, M.  
February 26, 1959  
Massachusetts Institute of Technology, Lincoln Laboratory, Lexington

Group Report 54-2, AF 19(122)-458  
(See also *IRE Transactions on Automatic Control*, v. AC-4, no. 2, pp. 10-15, November 1959; *1959 IRE National Convention Record, Part 4—Automatic Control, Electronic Computers, and Information Theory*, pp. 12-17, 1959)

Dynamic programming, which may be used to treat a class of problems dealing with random variables whose distributions are initially imperfectly unknown in multi-stage decision processes, is discussed.

2,334. CHOICE OF AN OPTIMUM AMPLIFICATION FACTOR FOR A SELF-ALIGNING CONTROL SYSTEM

Perelman, I. I.

*Automation and Remote Control*, v. 20, no. 2, pp. 177-197, printed 1959  
(English translation of *Avtomatika i Telemechanika*, v. 20, no. 2, pp. 184-191, February 1959)

2,335. A CONTROLLER TO OVERCOME DEAD TIME

Smith, O. J. M.

*ISA Journal*, v. 6, no. 2, pp. 28-33, February 1959

2,336. THE ROLE OF DIGITAL COMPUTERS IN THE DYNAMIC OPTIMIZATION OF CHEMICAL REACTIONS

Kalman, R. E., Koepke, R. W.

In "Proceedings of the Western Joint Computer Conference, San Francisco, Calif., March 3-5, 1959," pp. 107-116  
Institute of Radio Engineers, Inc., New York, N.Y., 1959

2,337. OPTIMIZING CONTROL SYSTEMS FOR PROCESS INDUSTRIES

Burt, D. A., Van Nice, R. I.

*Westinghouse Engineer*, v. 19, no. 2, p. 38, March 1959

2,338. REGELSYSTEME MIT LAUFZEIT (CONTROL SYSTEMS WITH TRANSPORT TIME LAGS)

Euler, K.

*Regelungstechnik*, v. 7, no. 3, pp. 89-92, March 1959

Development is discussed of a 1-B control system with particularly short response times. The electric analog of the controller used in these studies is described. (*EI*, 1959)

2,339. PROCEEDINGS OF THE SELF ADAPTIVE FLIGHT CONTROL SYSTEMS SYMPOSIUM [JANUARY 13-14, 1959]

Gregory, P. C., Editor

March 1959

Wright Air Development Center, Flight Control Lab., Wright-Patterson AFB, Ohio  
WADC-TR-59-49  
AD-209,389

2,340. LIST OF NATIONAL AND FOREIGN PUBLICATIONS 1956, ON AUTOMATIC CONTROL AND RELATED SUBJECTS

Vildt, E. O., Landsberg, R. S., Compilers  
Khramoi, A. V., Editor

*Automation and Remote Control*, v. 20, no. 3, pp. 366-386, printed 1959  
(English translation of *Avtomatika i Telemechanika*, v. 20, no. 3, pp. 381-400, March 1959)

2,341. ON ADAPTIVE CONTROL SYSTEMS

Braun, L., Jr., Truxal, J. G.

April 27, 1959

Brooklyn, Polytechnic Institute of, Microwave Research Institute, N.Y.  
Research Report 735-59, PIB-663,  
DA-30-069-ORD-1560  
AD-216,899

(See also *IRE Transactions on Automatic Control*, v. AC-4, no. 2, pp. 30-42, November 1959; [discussion by R. M. du Plessis and reply by L. Braun, Jr.] v. AC-6, February 1961)

A philosophy is developed by considering the behavior of a human being acting as a controller in situations which require adaptation. The problem is divided into two parts: identification and excitation. Mechanization of the solutions of these two parts produces an adaptive control system.

- 2,342. PRINTSIPY POSTROENIYA BESKONTAKTNYKH SISTEM TELEUPRAVLENIYA S EKSPONENTSIALNYMI PREOBRAZOVATELYAMI (DESIGN PRINCIPLES OF CONTACTLESS SYSTEMS OF REMOTE CONTROL WITH EXPONENTIAL CONVERTERS)  
Ilin, V. A.  
*Avtomatika i Telemekhanika*, v. 20, no. 4, pp. 468-472, April 1959

Design considerations for new signal time separation systems are presented, as well as formulas to determine the main parameters of the systems. (*EI*, 1959)

- 2,343. A CLASS OF OPTIMUM CONTROL SYSTEMS  
Merriam, C. W., III  
*Journal of the Franklin Institute*, v. 267, no. 4, pp. 267-281, April 1959

- 2,344. THREE WAYS TO USE COMPUTERS IN PROCESS CONTROL  
Pink, J. F.  
*ISA Journal*, v. 6, no. 4, pp. 56-60, April 1959

- 2,345. FUNCTIONAL EQUATIONS IN ADAPTIVE PROCESSES AND RANDOM TRANSMISSION  
Bellman, R. E., Kalaba, R.  
*IRE Transactions on Circuit Theory*, v. CT-6, Special Supplement, pp. 271-282, May 1959

- 2,346. ADAPTIVE OR SELF OPTIMIZING CONTROL SYSTEMS: BIBLIOGRAPHY  
Stromer, P. R., Compiler  
*IRE Transactions on Automatic Control*, v. AC-4, no. 1, pp. 65-68, May 1959

Servos designed for operation in a slowly changing environment as opposed to servos intended for a fixed environment are discussed. Optimizer controls and similar devices which hunt and adjust to preset optimum conditions are considered as adaptive servos. 47 references. (*EI*, 1959)

- 2,347. STATIC DELAY CIRCUIT CONTROLS INDEX ACTION  
Vielehr, J. E.

*Automation*, v. 6, no. 5, pp. 89-91, May 1959

A control circuit is described in which a contactless switching reactor and an elementary resistance-capacitance network provide for a time delay action. An example is given of the method by which indexing of a traying attachment is controlled in synchronism with a discharge of parts from a forming machine. (*EI*, 1959)

- 2,348. UEBER DIE BESEITIGUNG DES EINFLUSSES VON TOTZEIT AUF DIE DYNAMISCHEN EIGENSCHAFTEN VON NICHTLINEAREN IMPULSREGELSYSTEMEN (ELIMINATION OF INFLUENCE OF DEAD TIME ON DYNAMIC PROPERTIES OF NONLINEAR PULSE REGULATED CONTROL SYSTEMS)  
Tsyplkin, Ya. S.  
*Regelungstechnik*, v. 7, no. 6, pp. 196-198, June 1959

Two compensation methods to replace the dead time of a system with control action delayed by certain constant time are shown. (*EI*, 1959)

- 2,349. STUDY OF PERFORMANCE CRITERIA FOR MODEL-REFERENCE TYPE ADAPTIVE CONTROL SYSTEMS  
Osborn, P. V.  
August 1959  
Massachusetts Institute of Technology,  
Cambridge  
Thesis  
AD-244,411

- 2,350. ON THE IDENTIFICATION AND COMMAND PROBLEMS IN COMPUTER-CONTROLLED ADAPTIVE SYSTEMS  
Mishkin, E., Haddad, R. A.  
September 3, 1959  
Brooklyn Polytechnic Institute of,  
Microwave Research Institute, N.Y.  
Research Report 767-59, PIB-695,  
DA 30-069-ORD-2646  
AD-228,626  
(See also 1959 IRE WESCON Convention Record, Part 4—Automatic Control, Electronic Computers, and Information Theory, pp. 125-135, 1959)

In order to satisfy stringent performance requirements in a dynamic process, a computer is incorporated as a central element in the feedback loop. The computer performs the dual task of identifying or measuring the dynamics of the process, and thence generating an appropriate command or actuating signal so as to satisfy the over-all specifications. The family of singularity functions (steps, ramps, confluent parabolas) is used as the command signal. The process' dynamics is monitored and identified by the computer without recourse to interrupting test signals such as periodic impulses or white noise. The stored energy term inherent in many measurement problems in continuous processes is accounted for in a novel manner. (ASTIA)

**2,351. TRANSISTOR TIME DELAY FOR INDUSTRIAL CONTROL**

Szmauz, L., Bakes, H.

*Electronics*, v. 32, no. 39, pp. 74-75,

September 25, 1959

A time delay relay that is adjustable and which can replace synchronous timers in industrial control circuits is discussed. Advantages of the relay are timing repeatability and instant recycling so as to provide maximum speed in automatic operations. Basic operation and timing circuit are described. (EI, 1959)

**2,352. SOME ASPECTS OF ADAPTIVE CONTROL PROCESSES**

Kalaba, R.

September 29, 1959

Rand Corp., Santa Monica, Calif.

Paper 1809

This paper provides a brief introduction to the study of adaptive control processes, and shows how the functional equation technique of dynamic programming can be employed in analytical and computational treatment. Adaptive processes pertaining to a system governed by an inhomogeneous Van der Pol equation are discussed.

**2,353. ADAPTIVE SERVOMECHANISMS**

Johnson, C. W.

*IRE Transactions on Medical Electronics*,

v. ME-6, no. 3, pp. 134-140, September 1959

The control engineer's approach to the problem of developing servomechanisms which exhibit some degree of adaptive behavior is presented. Several categories of adaptive systems are discussed, and an attempt is made to associate the operating principle of the systems in each

category with the behavior of the human being when he acts as a controlling device. A particular system developed for application in the field of automatic flight control is discussed from a functional point of view. The controller, using an analog model which operates on the input information, determines a "standard of performance" for the controlled element which closely approximates the performance desired by an experienced operator. The controller, using a very simple passive network as a switching function computer to determine the state of a bistable device, forces the controlled element to operate in such a manner as to minimize continuously the error between the desired performance and the actual performance. The controller exhibits adaptive behavior in the sense that it operates in such a manner as to keep the actual performance of the system practically invariant, although the parameters of the controlled element change over a relatively wide range of values.

**2,354. ADAPTATION IN FEEDBACK CONTROL SYSTEMS**

McCausland, I.

*Journal of the Franklin Institute*,

v. 268, no. 3, pp. 143-147, September 1959

**2,355. ADAPTIVE CONTROL OF CURVE-FOLLOWING DEVICES**

Nielsen, C. E., Jr.

September 1959

Massachusetts Institute of Technology,

Electronic Systems Lab., Cambridge

TM 6873-TM-11, AF 33(038)24007,

AD-229,020

Current tracer-controlled milling machines operate with a single probe sensing the template and have a fixed system response which cannot be optimum for certain template shapes. The feasibility of utilizing additional probes is investigated to obtain future information from a template of the desired surface, to permit the system response to be varied (adapted) so that optimum following is achieved. A mathematical model of a tracer-controlled milling machine is assumed and the adaptive control theory is applied to determine the optimum control configuration for the system for two cases. The assumption is made that an exact knowledge of all future values of the desired surface cannot be supplied to the system. The major objective is to develop a method by which the optimum response is closely approximated using a simplified probe arrangement on the desired surface. The multiple probes measure specific values of the desired response and supply this information con-

tinuously to a simple realization of the optimum control configuration. An analog computer was used to simulate the mathematical model and study its response to various inputs and conditions. (ASTIA)

2,356. TRENDS IN ADAPTIVE CONTROL SYSTEMS

Truxal, J. G.

In "Proceedings of the National Electronics Conference, Vol. 15, Chicago, Ill., October 12-14, 1959," pp. 1-16  
National Electronics Conference, Inc., Chicago, Ill., 1960

2,357. MULTIDIMENSIONAL ADAPTIVE CONTROL

Gibson, J. E.

In "Proceedings of the National Electronics Conference, Vol. 15, Chicago, Ill., October 12-14, 1959," pp. 17-26  
National Electronics Conference, Inc., Chicago, Ill., 1960

2,358. ON THE THEORY OF ADAPTIVE CONTROL SYSTEMS, THE LEARNING MODEL APPROACH

Margolis, M., Leondes, C. T.  
October 1959

California, University of, Los Angeles Report, AFOSR TN-59-1200, AF 49(638)-438 AD-233,275

The use of a process adaptive system makes it possible to design the complete control system for a specified requirement without compromising the setting of the controller parameters for the range of dynamic characteristic variation. The learning model determines these variations and presents the exact values to the proper computing circuits for adjusting the parameters in the controller.

2,359. ON ADAPTIVE CONTROL PROCESSES

Bellman, R. E., Kalaba, R.

*IRE Transactions on Automatic Control*, v. AC-4, no. 2, pp. 1-9, November 1959

2,360. PROGRESS REPORT ON OPCON: DOW EVALUATES OPTIMIZING CONTROL

Bernard, J. W., Soderquist, F. J.

*Control Engineering*, v. 6, no. 11, pp. 124-128, November 1959

2,361. A PRACTICAL STANDARD TRANSISTORIZED OPTIMUM RESPONSE CONTROLLER

Chen, K., Little, D. R.

*AIEE, Transactions of the, Part II—Applications and Industry*, no. 45, pp. 337-345, November 1959

2,362. MATERIALS HANDLING AND AUTOMATION

Goodman, L. L.

*Institution of Electrical Engineers, Journal of the*, v. 5, no. 60, pp. 689-694, December 1959

The role of electrical engineering in movement and storage of materials in industrial organization is discussed. Novel developments, including automatic and radio control of cranes and conveyors for warehousing, are described as well as electronic inspection and sorting devices.

2,363. ADAPTIVE FLIGHT CONTROL

[ABSTRACT]

Schuck, O. H.

*IRE Transactions on Automatic Control*, v. AC-4, no. 3, p. 113, December 1959

2,364. TIMED-PROGRAM SYSTEM ROBOTS PROCESSING

Ziembra, J. V.

*Food Engineering*, v. 31, pp. 62-63, December 1959

2,365. CALCULATION OF A SELF-ADAPTING SERVOSYSTEM HAVING TWO-STEP PARAMETER CONTROL

Kozlov, Iu. M.,

*Izvestiya Akademii Nauk, SSSR, Otdelenie Tekhnicheskikh Nauk, Energetika i Avtomatika*, no. 4, pp. 112-115, 1959 (in Russian)

2,366. THE DESIGN AND ANALYSIS OF AN ADAPTIVE SYSTEM FOR STATISTICAL CLASSIFICATION

Mattson, R. L.

1959

Massachusetts Institute of Technology, Cambridge Thesis

- 2,367. SYNTHESIS OF ADAPTIVE CONTROLS  
Merriam, C. W., III  
1959  
Massachusetts Institute of Technology,  
Servomechanisms Lab., Cambridge  
Report 7793-R-3
- 2,368. ADAPTIVE SAMPLED-DATA SYSTEMS—  
A STATISTICAL THEORY OF ADAPTATION  
Widrow, B.  
*1959 IRE WESCON Convention Record, Part 4*  
—Automatic Control, Electronic Computers,  
and Information Theory, pp. 74–85, 1959
- 2,369. A PARAMETER TRACKING SERVO FOR  
ADAPTIVE CONTROL SYSTEMS  
Margolis, M., Leondes, C. T.  
*1959 IRE WESCON Convention Record, Part 4*  
—Automatic Control, Electronic Computers,  
and Information Theory, pp. 104–115, 1959
- 2,370. DYNAMIC PROGRAMMING AND  
ADAPTIVE PROCESSES: MATHEMATICAL  
FOUNDATION  
Bellman, R. E., Kalaba, R.  
*IRE Transactions on Automatic Control*,  
v. AC-5, no. 1, pp. 5–10, January 1960  
(See also P-1416, July 3, 1958, and Revision,  
February 6, 1959, Rand Corporation, Santa  
Monica, Calif.)
- This paper formulates a foundation for the mathematical treatment of broad classes of adaptive processes, accomplished through use of the concepts of dynamic programming.
- 2,371. CONTROL BY STOCHASTIC ADJUSTMENT  
Bertram, J. E.  
*AIEE, Transactions of the, Part II—Applications  
and Industry*, no. 46, pp. 485–491,  
January 1960
- 2,372. USE OF A MATHEMATICAL ERROR  
CRITERION IN THE DESIGN OF  
ADAPTIVE CONTROL SYSTEMS  
Merriam, C. W., III  
*AIEE, Transactions of the, Part II—Applications  
and Industry*, no. 46, pp. 506–512, January 1960
- 2,373. EXECUTIVE-CONTROLLED ADAPTIVE  
SYSTEMS  
Staffin, R.

*AIEE, Transactions of the, Part II—Applications  
and Industry*, no. 46, pp. 523–529,  
January 1960

- 2,374. ON THE PHILOSOPHY OF ADAPTIVE  
CONTROL FOR PROCESS ADAPTIVE  
SYSTEMS  
Margolis, M., Leondes, C. T.  
January 1960  
California, University of, Los Angeles  
Report, AFOSR TN-59-1199  
AF 49(638)-438  
AD-239,499

This paper describes a very general approach to the design of process adaptive systems. First, a brief look is taken at the development of feedback control theory and practice. Then process adaptive control is discussed as a logical extension of the basic concepts of feedback theory. A particular mechanism for process adaptive control is suggested. The parameters of the model are used to set the parameters of the controller for the over-all control of the system.

- 2,375. SELF-OPTIMIZING SERVO CIRCUITS  
Nightingale, J. M.  
*Machine Design*, v. 32, no. 1,  
pp. 139–143, January 1960

- 2,376. DYNAMIC PROGRAMMING AND  
NUMERICAL EXPERIMENTATION AS  
APPLIED TO ADAPTIVE CONTROL  
SYSTEMS  
Aoki, M.  
February 1960  
California, University of, Los Angeles  
Report 60-16

Starting from a set of stringent assumptions on deterministic control systems and relaxing some of the assumptions to more realistic forms, progress is made toward mathematical formulations of stochastic and adaptive control processes. It is assumed that the only uncertainty associated with the system is such that the actual outcome of a decision is not known until the resulting transformation has taken place.

- 2,377. ON THE DESIGN OF A HIGH-GAIN  
SATURATING CONTROL SYSTEM FOR  
USE AS AN ADAPTIVE AUTOPILOT  
McLean, J. D., Schmidt, S. F.  
February 1960

National Aeronautics and Space Administration,  
Washington, D.C.  
**TN D-305**  
**AD-232,495**

A theoretical investigation shows the system studied can control an aircraft over very large ranges of flight conditions without resort to air data measurements. Analytical methods are presented for predicting the frequency, amplitude, and effect on performance of the inherent limit cycle or chatter. Methods are also given for reducing the chatter amplitude and its undesirable effects on the low-frequency response. At low dynamic pressures, limiting and low aerodynamic gain can result in poor damping or instability. One method of compensating for this difficulty is presented.

- 2,378. ELECTRICALLY-PROGRAMMED SMALL PARTS HANDLING DEVICE**  
*Automatic Control*, v. 12, no. 2, pp. 33-36,  
February 1960

Features of "Transfe-Robot" system, which is intended to be a replacement for human operators in medium-length production runs, are detailed.

- 2,379. AN OPTIMIZATION THEORY FOR FEEDBACK CONTROL SYSTEM DESIGN**  
Merriam, C. W., III  
*Information and Control*, v. 3, no. 1,  
pp. 32-59, March 1960

- 2,380. STUDY OF ADAPTIVE AND TIME SHARED CONTROL SYSTEMS**  
Franklin, G., Shaw, L., Henry, E.  
April 30, 1960  
Stanford University, Stanford Electronics Labs., Calif.  
Annual Summary Report, Nonr-22538, Project  
NR 049 132  
**AD-239,329**

The solutions of two problems which arise from the use of a digital controller in an automatic control system are reported. The first of these problems is termed adaptive control and concerns the design of a system which changes its method of control (adapts) to changes in the character of its inputs or other aspects of the control environment. Many adaptive schemes have been proposed in the literature and used with varying degrees of success. The approach taken in the research reported is to provide a logical design procedure for a controller

which adapts by a choice or decision between a small number of alternatives. The first designs have been directed toward adaptation in the simplest case imaginable, which is in the presence of an input which has two possible states. The schemes which have been derived show improved performance over other alternatives for the same job. The second problem is the time-share problem or the design of a digital controller for the simultaneous control of more than one process or plant by sequential attention. The questions of possible control assignment schedule and design methods for given assignment schedules have been considered and a number of alternate solutions to both parts of the problem obtained. A practical solution of the optimal assignment schedule for a given over-all system performance criterion and controller performance constraints remains to be achieved. (ASTIA)

- 2,381. A CALCULATION OF SWITCHING FUNCTIONS AS A MEANS OF MINIMIZING ERROR IN AN ON-OFF CONTROL SYSTEM**  
Brown, R. F.  
April 1960  
Institution of Electrical Engineers, London, England  
Monograph 470M

- 2,382. ADAPTIVE CONTROL CONSIDERATIONS FOR RE-ENTRY FLIGHT**  
Clark, J. W., Ahlberg, J. H.  
April 1960  
Society of Automotive Engineers, Inc., New York, N.Y.  
Paper 175B, presented at the SAE National Aeronautical Meeting, New York, N.Y., April 5-8, 1960

Objectives of maneuvers required to land a manned space vehicle at a predesignated airfield on Earth, the types of control and stabilization systems which can be used in each external environment, and the sources of moments which disturb the orientation of the vehicle are discussed in Part I of this paper. Part II describes an inductive experiment performed on an IBM 704 computer to determine the feasibility of using mechanical methods to optimize the dynamic response of a physical system in a changing environment.

- 2,383. SELF-ADAPTIVE CONTROL SYSTEMS**  
Thaler, G.  
April 1960

- Naval Post Graduate School, Monterey, Calif.  
Technical Report 18  
AD-237,711
- 2,384. STOCHASTIC TIME OPTIMAL  
CONTROL SYSTEM  
Aoki, M.,  
May 1960  
California, University of, Los Angeles  
UCLA Report 60-35  
AD-239,653
- 2,385. ADAPTIVE CONTROL SYSTEMS USING  
SINUSOIDAL TEST SIGNALS  
Hannen, R. A.  
May 1960  
Ohio State University, Columbus  
Report  
AD-240,775
- Adaptive control systems employing a dc signal to specify the optimum parameter value and those employing a model to specify such optimum are described. The basic operation of both slow- and high-speed systems is discussed.
- 2,386. SYNTHESIS OF AN OPTIMUM  
DISTILLATION CONTROLLER  
Beecher, A. E.  
June 1960  
Massachusetts Institute of Technology,  
Electronics System Lab., Cambridge  
Report 7793-R-7
- 2,387. ADAPTIVE AND OPTIMIZING  
CONTROL SYSTEMS  
Eykhoff, P.  
*IRE Transactions on Automatic Control*,  
v. AC-5, no. 2, pp. 148-151, June 1960
- 2,388. SOVIET LITERATURE ON CONTROL  
SYSTEMS  
Simmons, P. L., Pappo, H. A.  
*IRE Transactions on Automatic Control*,  
v. AC-5, no. 2, pp. 142-147, June 1960
- 2,389. ADAPTIVE SWITCHING CIRCUITS  
Widrow, B., Hoff, M. E.  
June 1960  
Stanford University, Stanford Electronics Labs.,  
Calif.  
Report 1553-1
- 2,390. A STUDY TO DETERMINE THE  
FEASIBILITY OF A SELF-OPTIMIZING  
AUTOMATIC FLIGHT CONTROL SYSTEM  
June 1960  
Ford Motor Co., Aeronutronic Div., Newport  
Beach, Calif.  
Final Report, WADD TR 60-201, AF 33(616)5050  
AD-240,992
- 2,391. ADAPTIVE SAMPLED-DATA SYSTEMS  
Widrow, B.  
July 15, 1960  
Stanford University, Stanford Electronics Labs.,  
Calif.  
Technical Report 2104-1  
AD-243,265
- 2,392. OPTIMIZATION OF THE ADAPTIVE  
FUNCTION BY A Z-TRANSFORM METHOD  
Chang, S. S. L.  
*AIEE, Transactions of the, Part II—Applications  
and Industry*, no. 49, pp. 223-231, July 1960
- 2,393. A SURVEY OF THE PHILOSOPHY AND  
STATE OF THE ART OF  
ADAPTIVE SYSTEMS  
Cooper, G. R., Gibson, J. E.  
July 1960  
Purdue University, Lafayette, Ind.  
PRF 2358
- 2,394. MAKING SENSE OUT OF THE  
ADAPTIVE PRINCIPLE  
Gibson, J. E.  
*Control Engineering*, v. 7, no. 8, pp. 113-119,  
August 1960
- 2,395. A METHOD OF ADAPTIVE CONTROL  
FOR HIGH-ORDER SYSTEMS  
Huber, E. A.  
August 1960  
Illinois, University of, Urbana  
Report R-121  
AD-243,268
- 2,396. SYNTHESIS OF A SELF ADAPTIVE  
AUTO-PILOT FOR A LARGE  
ELASTIC BOOSTER  
Smith, G. W.  
*IRE Transactions on Automatic Control*,  
v. AC-5, no. 3, pp. 229-236, August 1960

- 2,397. REGRESSION TECHNIQUES IN MULTIVARIATE ADAPTIVE CONTROL SYSTEMS  
Bishop, A. B., Chope, H. R.  
Institute of Radio Engineers, Inc., New York, N.Y.  
Paper presented at the Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, September 6-9, 1960
- 2,398. OPTIMALIZING CONTROL SYSTEMS WITH PROCESS-DYNAMIC IDENTIFICATION  
Eykhoff, P., Smith, O. H. M.  
Institute of Radio Engineers, Inc., New York, N.Y.  
Paper presented at the Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, September 6-9, 1960
- 2,399. AN ADAPTIVE THREE-MODE CONTROLLER FOR THE PROCESS INDUSTRIES  
Field, B. W.  
Institute of Radio Engineers, Inc., New York, N.Y.  
Paper presented at the Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, September 6-9, 1960
- 2,400. OPTIMUM DESIGN OF PASSIVE-ADAPTIVE CONTROL SYSTEMS  
Fleischer, P. R.  
Institute of Radio Engineers, Inc., New York, N.Y.  
Paper presented at the Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, September 6-9, 1960
- 2,401. INTEGRAL TRANSFORM FOR ALGEBRAIC ANALYSIS AND DESIGN OF A CLASS OF LINEAR-VARIABLE AND ADAPTIVE CONTROL SYSTEMS  
Johnson, G. W., Kilmer, F. G.  
Institute of Radio Engineers, Inc., New York, N.Y.  
Paper presented at the Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, September 6-9, 1960
- 2,402. ADAPTIVE CONTROL THROUGH SINUSOIDAL RESPONSE  
Smith, K. C.  
Institute of Radio Engineers, Inc., New York, N.Y.  
Paper presented at the Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, September 6-9, 1960

- 2,403. ADAPTIVE SERVO TRACKING  
Talkin, A. I.  
September 20, 1960  
Diamond Ordnance Fuze Laboratories,  
Washington, D.C.  
TR-860, DA-5U16-004  
AD-244,322

This report describes a self-adapted, sampled-data tracking loop. The tracking loop may be considered to be a low-pass filter with a variable bandwidth. The loop is designed to adapt rapidly to changes in the input signal by monitoring both the apparent error and the loop output. Results show a tracking accuracy of 25 to 34% higher than that of a comparable linear system at a receiver S/N ratio of 10 db.

- 2,404. ELEKTRICHESKII VAL V PRIVODE METALLOREZHUSHCHIKH STANKOV (SYNCHRONOUS LINKS IN METAL CUTTING MACHINE DRIVES)  
Alekseeva, N. N.  
*Stanki i Instrument*, v. 31, no. 9, pp. 23-27, September 1960  
(See also English translation in *Machines and Tooling*, v. 31, no. 9, pp. 24-29, 1960)

An electrical synchronizing system using reactive synchronous motors is recommended if electrical regulation is not required and if the power of units being synchronized is very low. A selsyn synchronizing system with rotary magnetic and intermediate amplifiers is suggested for a system requiring wide range of electrical control, close accuracy, and rapid action, and also for certain large lathes and vertical borers. (EI, 1961)

- 2,405. LEARNING IN CONTROL SYSTEMS  
Andrew, A. M.  
*Control*, v. 3, no. 27, pp. 99-103, September 1960

A review is given of existing devices, and a discussion is presented of principles upon which learning devices eventually used in automatic control are based. The principles considered are model-adjustment vs. control-function adjustment, move-and-stick vs. correlation, learning-to-learn, self-organization, and concept-formation. Sequential learning machines are explained. 24 references. (EI, 1961)

- 2,406. DYNAMIC PROGRAMMING APPROACH TO A FINAL-VALUE CONTROL SYSTEM WITH A RANDOM VARIABLE HAVING AN UNKNOWN DISTRIBUTION FUNCTION

Aoki, M.

*IRE Transactions on Automatic Control*, v. AC-5, no. 4, pp. 270-282, September 1960

- 2,407. EFFECT OF ADAPTIVE LOOP TIME LAGS ON DYNAMIC PERFORMANCE OF CONTROL SYSTEM

Galbiati, I. J., Meserve, W. E.  
September 1960

Instrument Society of America, Pittsburgh, Pa.  
Paper 69-NY 60, presented at the ISA Meeting,  
New York, N.Y., September 26-30, 1960

The use of the root locus approach for the solution of the problem of adaptive compensation in the form of either stepwise variation or continuous variation of gain and time constant of some part of the main control system is discussed. Examples of application of the method to open the adaptive loop system where environment affects only the time constant of one block of the system are given. Determination of the effect of time lag in a closed adaptive loop system is discussed. 92 references. (EI, 1961)

- 2,408. USING A DIGITAL COMPUTER TO OPTIMIZE CONTROL OF A CONTINUOUS CHEMICAL PROCESS

Haickl, F. W.  
September 1960

Instrument Society of America, Pittsburgh, Pa.  
Paper 113-NY 60, presented at the ISA Meeting,  
New York, N.Y., September 26-30, 1960

- 2,409. MECHANIZING THE ADAPTIVE PRINCIPLE

Gibson, J. E.  
*Control Engineering*, v. 7, no. 10,  
pp. 109-113, October 1960

- 2,410. SPECIFICATION AND DATA PRESENTATION IN LINEAR CONTROL SYSTEMS

Gibson, J. E., McVey, E. S., Leedham, C. D.,  
Rekasius, Z. V., Sridhar, R.  
October 1960

Purdue University, School of Electrical

Engineering, Lafayette, Ind.

Final Report, Volume 1, AFMDC-TR-60-2,  
AF 29(600)-1933

Included in this report are an operational definition of linearity, frequency domain specifications, time domain specifications, specifications of a control system on a statistical basis, and a graphical presentation of system design data.

- 2,411. ADAPTIVE CONTROL SYSTEMS SURVEY

Mathias, R. A., Van Nice, R. I.  
*Electro-Technology*, v. 66, no. 4,  
pp. 116-125, October 1960

A review is presented of developments and classification of specific adaptive systems, with emphasis on functional similarity of seemingly dissimilar methods. Computers as adapters and learning adaptive systems are discussed. (EI, 1961)

- 2,412. INNOVATIONS IN NUMERICAL CONTROL

McGarrell, P. H.  
*Control Engineering*, v. 7, no. 10,  
pp. 139-145, October 1960

Design features of four novel machine tool controls are examined. A transistorized contouring system featuring a detachable director is discussed. Coded air cylinders for controlling table position, prepunched keys to permit rapid setup of drum programmer, and a magnetic scale to substitute for a light chopper are also considered. (EI, 1961)

- 2,413. PROCTIROVANIE SISTEM PNEVMO-AVTOMATIKI S PNEVMATICHESKIM PUTEVYM KONTROLEM (DESIGN OF PNEUMATIC AUTOMATIC SYSTEMS FOR TRAVERSE CONTROL)

Shcherbakov, V. T., Yuditskii, S. A.  
*Stanki i Instrument*, v. 31, no. 10, pp. 1-5,  
October 1960  
(See also English translation in *Machines and Tooling*, v. 31, no. 10, pp. 2-7, 1960)

Reasons are given for the growing use of pneumatic drives to solve machine automation problems. A description is presented of a method developed by ENIMS for drawing up main schemes for pneumatic automatic control systems. Impulses determining sequence of the system are transmitted from piston rods at the end of their stroke. (EI, 1961)

2,414. ADAPTIVE SERVOMECHANISMS AND THE X-15 INERTIAL REFERENCE SYSTEM

Cap, S.,  
*Sperry Engineering Review*, v. 1, no. 3, p. 12,  
November 1960

*Avtomatika i Telemekhanika*, v. 21, no. 11,  
pp. 1465-1474, November 1960  
(See also English translation in *Automation and Remote Control*, v. 21, no. 11, pp. 1040-1046, May 1961)

2,415. CLOSED-LOOP COMPUTER CONTROL AT LULING

Eisenhardt, R. D., Williams, T. J.  
*Control Engineering*, v. 7, no. 11,  
pp. 103-114, November 1960

The accuracy of such systems where adjustment is made by using a gradient method is discussed. The variable controlling signals, variable object parameters, and random disturbances are also considered. (EI, 1961)

2,416. KONTROL I BLOKIROVKA V AVTOMATICHESKIKH STANOCHNYKH LINIYAKH (CONTROL AND BLOCKING IN AUTOMATIC TRANSFER LINES)

Ivenskii, Yu. N., Tuller, A. G.  
*Stanki i Instrument*, v. 31, no. 11,  
pp. 3-5, November 1960  
(See also English translation in *Machines and Tooling*, v. 31, no. 11, pp. 3-5, 1960)

Methods employed to reduce breakage and cut downtime of idle machines are discussed. A simple control device for tool wear based on a step-by-step selector, devised by Special Design Bureau-8 of Minsk automatic production line factory, is examined. (EI, 1961)

2,417. THEORY OF IDEAL MODELS OF AN EXTREMAL CONTROLLER

Kazakevitch, V. V.  
*Automation and Remote Control*, v. 21, no. 4,  
pp. 338-347, November 1960  
(English translation of *Avtomatika i Telemekhanika*, v. 21, no. 4, pp. 489-505, April 1960)

2,418. DINAMIKA SAMONASTRAIVAYU-SHCHIKHSYA SISTEM S EKSTREMALNOI NEPRERYVNOI NASTROIKOI KORREKTIRUYUSHCHIKH TSEPEI PRI SLUCHAINYKH VOZMUSHCHENIYAKH (DYNAMICS OF SELF-ADAPTIVE SYSTEMS WITH EXTREMAL CONTINUOUS ADJUSTMENT OF COMPENSATING NETWORK IN PRESENCE OF RANDOM DISTURBANCES)

Kazakov, I. E.

2,419. EKVIVALENTNYE PREOBRAZOVANIYA POSLEDOVATELNOSTNYKH MASHIN (EQUIVALENT TRANSFORMATIONS OF SEQUENTIAL MACHINES)

Blokh, A. Sh.  
*Avtomatika i Telemekhanika*, v. 21, no. 11,  
pp. 1490-1496, November 1960  
(See also English translation in *Automation and Remote Control*, v. 21, no. 11, pp. 1057-1061, May 1961)

Definitions are given of transformations of and corresponding structures of machines. (EI, 1961)

2,420. GEDANKEN ZUR PRAKTISCHEN GESTALTUNG ZAHLENGESTEUERTER WERKZEUGMASCHINEN (REFLECTIONS CONCERNING PRACTICAL DESIGN OF NUMERICALLY CONTROLLED MACHINE TOOLS)

Simon, W.  
*Werkstatt und Betrieb*, v. 93, no. 11, pp. 693-701, November 1960

Description and critical examination of programming methods, input equipment, internal data processing, etc., of machine tools exhibited at 1960 Hanover Machine Tool Fair are presented. 23 references. (EI, 1961)

2,421. APPLIED MATHEMATICS IN CHEMICAL ENGINEERING, FUNDAMENTAL IDEAS AND APPLICATIONS OF OPTIMIZATION TECHNIQUES IN DESIGN AND CONTROL

Amundson, N. R., Aris, R., Kalman, R. E., Lapidus, L.  
December 1960  
American Institute of Chemical Engineers,  
New York, N.Y.  
Special Lecture Series

2,422. GENERALIZING THE ADAPTIVE PRINCIPLE

Gibson, J. E.

*Control Engineering*, v. 7, no. 12, pp. 93-96,  
December 1960

2,423. THREE-AXIS TAPE CONTROL RUNS MANUFACTURING MACHINE

Murphy, M.

*Control Engineering*, v. 7, no. 12, pp. 125-127,  
December 1960

A punched tape, three-axis control system of MT-3 Machining Center by Hughes Aircraft Co. for directing a two-axis positioning table and three traveling spindles is described. The numerically controlled manufacturing machine can mill, ream, tap, and bore. (*EI*, 1961)

2,424. CONTOURS WITHOUT COMPUTERS... BREAKTHROUGH IN NUMERICAL CONTROL

Heslen, R.

*Tool and Manufacturing Engineer*,  
v. 45, no. 6, pp. 52-55, December 1960

Tapes for contour machining can be developed without a computer by a control system developed at Thompson-Ramo-Wooldridge Corp. This new system employs a simplified tape format and special computational aids. The actual steps required to program and produce a sample part are illustrated on a pump flange. Operations include milling mill flange face, drilling 14 holes, and milling O-ring grooves. The possibilities of hand programming are considered. (*EI*, 1961)

2,425. BIOLOGICAL AND ARTIFICIAL INTELLIGENCE [LITERATURE SEARCH NO. 254]

Sweitzer, D. I., Compiler  
December 1960

Jet Propulsion Laboratory, California Institute of Technology, Pasadena  
AI/LS 254

A compilation is presented of references dealing with biological intelligence and its simulation. This background study was made with the view of possible construction of a machine for simulating thought processes, even to the extent of making independent decisions on the basis of sensory data coupled with programmed or learned experience. The result would be an adaptive sys-

tem of a high order. The coupling of man and machine is also considered.

2,426. THE EFFECT OF RANDOM NOISE ON THE STEADY-STATE OPERATION OF A STEP-TYPE EXTREMAL SYSTEM FOR AN OBJECT WITH A PARABOLIC CHARACTERISTIC

Tovstukha, T. I.

*Automation and Remote Control*, v. 21, no. 5, pp. 398-404, December 1960

(English translation of *Avtomatika i Telemechanika*, v. 21, no. 5, pp. 575-584, May 1960)

2,427. ADAPTIVE AUTOMATIC CONTROL SYSTEM FOR OBTAINING ALUMINUM BY THE ELECTROLYTIC PROCESS USING A COMPUTING DEVICE

Sarkisyan, E. P., Agababyan, M. M., Saakyan, P. S.

*Automation and Remote Control*, v. 21, no. 6, pp. 563-567, December 1960

(English translation of *Avtomatika i Telemechanika*, v. 21, no. 6, pp. 806-811, June 1960)

2,428. SOME OPTIMIZATION PROBLEMS IN CHEMICAL ENGINEERING

Aris, R., Bellman, R., Kalaba, R.

*Chemical Engineering Progress, Symposium Series*, v. 56, no. 31, pp. 95-102, 1960

2,429. AUTOMATIC OPTIMIZATION OF CHEMICAL PROCESSES

Box, G. E. P., Chanmugan, J.

1960

Wisconsin, University of, Dept. of Statistics, Madison

Technical Report 1

2,430. KOMBINIROVANNOW ISPOLZOVARIE UPTAVLENIIA POVOSMUSHCHENIUU I PRINCIPA SAMOIZMENIUA

PARAMETROV I SLEDIASCHIE SISTEME PRINEPOLNOM CHILSE DIFFERENTISIATOROV (COMBINED APPLICATION OF CONTROL BY DISTURBANCES AND THE PRINCIPLE OF ADAPTIVE PARAMETERS IN A

- SERVOMECHANISM WITH A LIMITED NUMBER OF DIFFERENTIATORS)  
Kostyuk, V. I.  
*Avtomatyka [Viddil Tekhnichnykh Nauk of Akademiiia USSR, Kiev]*, no. 1,  
pp. 36-37, 1960
- 2,431. A STUDY OF DIGITAL ADAPTIVE CONTROL SYSTEMS  
Tou, J. T., Joseph, P. D., Lewis, J. B.  
1960  
Purdue University, Lafayette, Ind.  
PRF 2327  
AD-245,097
- 2,432. ON THE GENERAL THEORY OF CONTROL SYSTEMS  
Kalman, R. E.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 1, pp. 481-492  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,433. SELF-OPTIMIZING OR ADAPTIVE CONTROL SYSTEMS  
Gibson, J. E.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 2, pp. 586-595  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,434. SELF-OPTIMIZING CONTROL MECHANISM AND SOME PRINCIPLES FOR MORE ADVANCED LEARNING MACHINES  
Andrew, A. M.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 2, pp. 636-644  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,435. PRINCIPLES FOR MODEL TECHNIQUES IN OPTIMIZING CONTROL  
Eckman, D. P., Lefkowitz, I.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 2, pp. 970-976  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,436. THE USE OF SELF-ADJUSTING AUTOMATIC CONTROL SYSTEMS  
Lerner, A. Ya.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 4, pp. 226-230  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,437. ADAPTIVE CONTROL PROCESSES BY AN ECONOMIC CRITERIA  
Milsum, J. M.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 4, pp. 231-240  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,438. A COMPARISON OF PREDICTIVE AND EXPLORATORY NOISES OF COMPUTER CONTROL FOR INDUSTRIAL PROCESSES  
Phister, M., Jr.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 4, pp. 241-245  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,439. SOME PRINCIPLES OF DESIGN OF A SYSTEM FOR OVERALL AUTOMATION OF LARGE-SCALE CHEMICAL PLANT AND THE OPTIMIZING OF THIS SYSTEM  
Ordyntsev, M. V.

In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 4, pp. 316-323  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961

- 2,440. AUTOMATIC CONTROL IN NUCLEAR REACTORS—SELF-OPTIMIZING SYSTEM Weill, J.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 4, pp. 395-397  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,441. AUTOMATIC CONTROL SYSTEM FOR ARC MELTING FURNACES Efroimovitch, Yu. E.  
In "Automatic and Remote Control," Proceedings of the First International Congress of the International Federation of Automatic Control, Moscow, 1960, v. 4, pp. 482-487  
Coales, J. F., Editor  
Butterworth and Co., Ltd., London, England, 1961
- 2,442. INVARIANCE AS A PRINCIPLE FOR DESIGNING MULTILOOP SELF-ADAPTIVE SYSTEMS Chinaev, P. I.,  
*Automation Express*, v. 3, no. 5, pp. 6-9, January 1961
- 2,443. AVTOMATICHESKAYA OPTIMIZATSIIA PROSTRANSTVENNOGO RASPREDEL'ENIYA (AUTOMATIC OPTIMIZATION OF SPATIAL DISTRIBUTION OF SOME PHYSICAL SUBSTANCE)  
Fitsner, L. N.  
*Avtomatika i Telemekhanika*, v. 22, no. 1, pp. 67-76, January 1961; no. 7, pp. 857-864, July 1961  
(English translation available in *Automation and Remote Control*, v. 22, no. 1, pp. 58-66, January 1961; no. 7, pp. 750-757, July 1961)

Theoretical questions concerned with solution of a problem by means of automatic search are considered. Applications include, besides problems in sound, light, and radio wave propagation, automatic parts assemblage, pattern layout of materials for stamping, etc. (EI, 1961)

2,444. COMPUTERS IN AUTOMATIC CONTROL SYSTEMS

Truxal, J. G.  
*IRE, Proceedings of the*, v. 49, no. 1, pp. 305-312, January 1961

Integration of computers into classical controller circuits permits the control system designer to expand in three important directions, viz, control of complex systems, adaptive control, and optimizing control. Each of these three aspects is discussed. (EI, 1961)

2,445. STUDYING THE ECONOMICS OF PROCESS COMPUTER CONTROL

Williams, T. J.  
*ISA Journal*, v. 8, no. 1, pp. 50-59, January 1961

2,446. LIMITS ON IDENTIFICATION TIME FOR LINEAR SYSTEMS

Cooper, G. R., Lindenlaub, J. C.  
February 1961  
Purdue University, Lafayette, Ind.  
TR-EE61-3

2,447. A CLASS OF PREDICTIVE ADAPTIVE CONTROL SYSTEMS

Gibson, J. E., Meditch, J. S.  
February 1961  
Purdue University, Lafayette, Ind.  
TR-EE61-2

2,448. CONTROL SYSTEM PERFORMANCE MEASURES—PAST, PRESENT, AND FUTURE

Schultz, W. C., Rideout, V. C.  
*IRE Transactions on Automatic Control*, v. AC-6, no. 1, pp. 22-35, February 1961

The development and use of expressions proposed to define system performance are reviewed. The importance of this performance index in design of adaptive systems is discussed. 68 references. (EI, 1961)

- 2,449. SIMULATOR STUDY OF TWO-PARAMETER ADAPTIVE SYSTEM  
McGrath, R. J., Rideout, V. C.  
*IRE Transactions on Automatic Control*, v. AC-6, no. 1, pp. 35-42, February 1961

Use of a sinusoidal parameter perturbation applied to a feedback control system to obtain an adaptive scheme which optimizes the system for changes in inputs and/or system parameters is discussed. Two or more parameters may be simultaneously adjusted if they are perturbed at different frequencies and each provided with an independent adaptive loop. It is shown that this scheme minimizes mean-square error in all cases. (*EI*, 1961)

- 2,450. PROBLEMS IN DESIGN OF NUMERICAL CONTROL EQUIPMENT FOR MACHINE TOOLS  
Coppin, K. J.  
*British Institution of Radio Engineers, The Journal of the*, v. 21, no. 3, pp. 249-255, March 1961

Requirements of general purpose equipment are examined from points of view of utilization, economic considerations, and maintenance factors. Relative merits of analog and digital systems are also examined, and choice of servo type and programming medium are considered. The results achieved with established equipment are presented. (*EI*, 1961)

- 2,451. ON "BANG-BANG" ADAPTIVE CONTROL SYSTEMS  
Kopp, R. E.  
*1961 IRE International Convention Record, Part 4—Automatic Control, Circuit Theory, and Information Theory*, pp. 3-17, March 1961

Techniques are described for applying "Adaptive Control" concept of design to the "Bang-Bang" or relay-type control system. Advantages include the fact that full output of the actuator is used at all times, and that input signal to controlled process is always well defined. (*EI*, 1961)

- 2,452. OPTIMUM SYSTEM SYNTHESIS RECENT SOVIET PROGRESS IN ADAPTIVE AND OPTIMAL CONTROL  
Peterson, E. L.  
March 1961  
General Electric Company, Schenectady, N.Y.  
Paper

- 2,453. IMPULSNYE ELEKTRONNYE USTROISTVA V STANKAKH S CHISLOVYM UPRAVLENIEM (ELECTRONIC IMPULSE DEVICES FOR NUMERICAL PROGRAM CONTROL OF MACHINE TOOLS)  
Zusman, V. G., Rozinov, A. G.  
*Stanki i Instrument*, v. 32, no. 3, pp. 1-5, March 1961  
(English translation available in *Machines and Tooling*, v. 32, no. 3, pp. 2-6, March 1961)

The use of control elements based on electron tubes is discussed. Also considered are a single-stage multivibrator, parallel and assembly gates on semiconductor triodes, and output switching amplifiers. (*EI*, 1961)

- 2,454. ANALITICHESKOE KONSTROIROVANIE REGULYATOROV (ANALYTICAL DESIGN OF CONTROLLERS)  
Letov, A. M.  
*Avtomatika i Telemekhanika*, v. 22, no. 4, pp. 425-435, April 1961  
(English translation available in *Automation and Remote Control*, v. 22, no. 4, pp. 363-372, April 1961)

Continuation of a former study includes a method of dynamic programming for the problem of analytical design of control systems that are optimum relative to integral square error. 20 references. (*EI*, 1961)

- 2,455. IMPULSNYE ELEKTRONNYE USTROISTVA NA FERROTRANZISTORAKH V STANKAKH S CHISLOVYM UPRAVLENIEM (ELECTRONIC IMPULSE DEVICES ON FERRITE ELEMENTS FOR NUMERICAL PROGRAM CONTROL OF MACHINE TOOLS)  
Zusman, V. G., Rozinov, A. G.  
*Stanki i Instrument*, v. 32, no. 4, pp. 3-9, April 1961  
(English translation available in *Machines and Tooling*, v. 32, no. 4, pp. 3-10, April 1961)

Reference is made to an investigation covering the possibility of utilizing ferrite elements for program-controlled machines and development of devices based on combining of ferrite elements with semiconductor triodes. Principles of operation of ferrite elements are discussed and recommendations made concerning selection of basic parameters. A typical diagram of units based on these elements is described. (*EI*, 1961)

- 2,456. A PARAMETER-PERTURBATION  
ADAPTIVE SYSTEM  
McGrath, R. J., Rideout, V. C.

*IRE Transactions on Automatic Control*,  
v. AC-6, no. 2, pp. 154-162, May 1961

- 2,457. TRANSFER-FUNCTION TRACKING AND  
ADAPTIVE CONTROL SYSTEMS

Weygandt, C. N., Puri, N. N.

*IRE Transactions on Automatic Control*,  
v. AC-6, no. 2, pp. 162-166, May 1961

In an adaptive system in which plant parameters are varying, it is necessary to track or measure these parameters. Two separate schemes are proposed for tracking transfer function of a multi-order system. (*EI*, 1961)

- 2,458. PRESENT STATE OF THE ART IN THE  
SPECIFICATION OF NONLINEAR  
CONTROL SYSTEMS

Gibson, J. E., McVey, E. S., Leedham, C. D.,  
Rekasius, Z. V., Schultz, D. G., Shidhar, R.  
May 1961

Purdue University, School of Electrical Engineering,  
Lafayette, Ind.

Interim Report 2, AF 29(600)-1933

This is an interim report on the specification of nonlinear automatic control systems. It is concerned primarily with assessing the state of the art of nonlinear control as a prelude to the solution of the actual specification problem.

- 2,459. STABILITY OF NONLINEAR CONTROL  
SYSTEM BY THE 3rd METHOD  
OF LIAPUNOV

Gibson, J. E., Meditch, J. S.  
May 1961

Purdue University, Lafayette, Ind.  
TR-EE61-5

- 2,460. ANALITICHESKOE KONSTROUROVANIE  
REGULYATOROV V STOKHASTICHESKIH  
SISTEMAKH PRI OGRANICHENIYAKH NA  
SKOROST IZMENENIYA UPRAVLYAYU-  
SHCHEGO VOZDEISTVIYA  
(ANALYTICAL DESIGN OF CONTROLLERS  
IN STOCHASTIC SYSTEMS WITH  
VELOCITY LIMITED CONTROLLING  
ACTION)

Krasovskii, N. N., Lidskii, E. A.

*Prikladnaya Matematika i Mekhanika*, v. 25,  
no. 3, pp. 420-432, May-June 1961  
(Translation available in *PPM; Journal of  
Applied Mathematics and Mechanics*, v. 25,  
no. 3, pp. 627-643, 1961)

The selection of a control process for a system in which the controlled object is subject to random changes is considered. (*EI*, 1961)

- 2,461. BIOLOGICAL AND ARTIFICIAL  
INTELLIGENCE [SUPPLEMENT TO  
LITERATURE SEARCH NO. 254]

Sweitzer, D. I., Compiler  
May 31, 1961

Jet Propulsion Laboratory, California Institute  
of Technology, Pasadena  
AI/LS 254, Supplement

- 2,462. CANNED AIR CIRCUITS—CANADIAN  
“FIRST”

Walle, L. I.  
*Canadian Machinery and Metalworking*,  
v. 72, no. 5, pp. 69-72, May 1961

A system of pneumatic controls for machine tools developed by Holman Bros. (Canada) is prefabricated, with a universal circuit entirely contained in a box. Its foremost advantage is that it can be preset by the manufacturer to the desired function. Being a universal circuit, the system can be transferred from one machine to another. (*EI*, 1961)

- 2,463. OPTIMUM DESIGN OF LINEAR  
MULTIVARIABLE DIGITAL  
CONTROL SYSTEMS

Tou, J. T., Joseph, P. D.  
June 1961

Purdue University, Lafayette, Ind.

TR-EE61-7

- 2,464. ADAPTIVE CONTROL

Westcott, J. H.  
*Control*, v. 4, no. 35, pp. 99-102, May 1961;  
no. 36, pp. 92-93, June 1961

A logical basis is given on which to assess adaptive systems, in order to discriminate between essential and trivial measures. A calculation of optimal trajectories is presented, and practical prospects are examined. (*EI*, 1961)

2,465. ANALYTICAL INVESTIGATION OF AN ADAPTIVE FLIGHT CONTROL SYSTEM USING SINUSOIDAL TEST SIGNAL

Harris, J. E.

June 1961

National Aeronautics and Space Administration,  
Washington, D.C.  
TN D-909

2,466. COMPUTERS FOR MANUFACTURING

Kuhnel, A. H.

*Tool and Manufacturing Engineer*, v. 46, no. 7,  
pp. 95-98, June 1961

Methods of applying computers advantageously to different production tasks are considered. General purpose computers for off-line and on-line manufacturing functions are discussed, and analog control computers are examined. The problem of computing lamination stacks is considered. (*EI*, 1961)

2,467. OPTIMIZATION OF PROCESS PERFORMANCE

Lapidus, L., Shapiro, E., Shapiro, S.,  
Stillman, R. E.

*AICHE Journal*, v. 7, no. 2, pp. 288-294,  
June 1961

2,468. PNEUMATIC LOGIC

Holbrook, E. L.

*Control Engineering*, v. 8, pp. 104-108,  
July 1961; pp. 92-96, August 1961;  
pp. 110-113, November 1961

2,469. DESIGN OF OPTIMAL QUANTIZED CONTROL SIGNAL SAMPLED-DATA SYSTEMS

Tou, J. T., Lewis, J. B.

July 1961

Purdue University, Lafayette, Ind.  
TR-EE61-8

2,470. DISCONTINUOUS AUTOMATIC CONTROL

Flugge-Lotz, I.

*Applied Mechanics Reviews*, v. 14, no. 8,  
pp. 581-584, August 1961

The development in the last decade and the present state of analysis and design of discontinuous automatic control processes are discussed. Nonlinear control is piecewise linear if a linear system (plant, vehicle) is controlled. The development of control shows that intentionally introduced nonlinearities can improve the behav-

ior of dynamic systems, and it is important to overcome analytic difficulties because of their advantages. 39 references. (*EI*, 1961)

2,471. INSTRUMENTATION, SUPERVISORY CONTROL SYSTEM UNVEILED

Harper, W.

*Gas*, v. 37, pp. 80-82, August 1961

2,472. CONTROL COMPUTERS EXTEND SCOPE OF INDUSTRIAL AUTOMATION

Harris, W. R., Harder, E. L.

*Iron Age*, v. 188, no. 10, pp. 104-106,  
September 7, 1961

A case of checking out a machine tool's feedback control system is considered. The reason digital concepts are used, almost without exception, in control computers is analyzed. The computer's relationship with other control and power devices is discussed. (*EI*, 1961)

2,473. A DYNAMIC SOLUTION TO A GENERALIZED CHEMICAL PROCESSING MODEL

Boydson, R. E.

In "Computers in Control," Papers presented at the 1960 and 1961 AIEE Control Computer Sessions, pp. 16-30

American Institute of Electrical Engineers, Inc.,  
New York, N.Y., September 1961

2,474. CONSIDERATIONS IN THE DESIGN OF A DYNAMIC CONTROL SYSTEM FOR THE GENERALIZED CHEMICAL PROCESSING MODEL CONSIDERED AS A NONLINEAR SYSTEM

Beecher, A. E., Gould, L. A.

In "Computers in Control," Papers presented at the 1960 and 1961 AIEE Control Computer Sessions, pp. 146-156

American Institute of Electrical Engineers, Inc.,  
New York, N.Y., September 1961

2,475. DYNAMIC OPTIMIZATION AND CONTROL OF A STIRRED-TANK CHEMICAL REACTOR

Gould, L. A., Kipiniak, W.

In "Computers in Control," Papers presented at the 1960 and 1961 AIEE Control Computer Sessions, pp. 229-241

American Institute of Electrical Engineers, Inc.,  
New York, N.Y., September 1961

- 2,476. COMPUTERS ENTER SMALL SHOPS  
*Iron Age*, v. 188, no. 11, pp. 184-185,  
September 1961  
(See also *Steel*, v. 149, no. 12, p. 114,  
September 18, 1961)

A new programming method developed by Rohr Aircraft Corp., Chula Vista, California, and Remington Rand Univac Division is used with a medium-scale general purpose digital computer. The programming package is able to guide control devices of various machine tool builders. The operation of the computer is discussed as well as the major savings obtained by its use. (*EI*, 1961)

- 2,477. A PNEUMATIC COMPUTER FOR  
PROCESS CONTROL—I  
Chapin, D. W.  
*ISA Journal*, v. 8, no. 9, pp. 38-43,  
September 1961

- 2,478. SELF-OPTIMIZING CONTROL SYSTEM BY  
MEANS OF LOGIC CIRCUIT  
Isobe, T.  
*IRE Transactions on Automatic Control*,  
v. AC-6, no. 3, pp. 260-266, September 1961

- 2,479. INTERCONNECTION OF HOIST AND  
CROWD CONTROLS: A STEP TOWARD  
SHOVEL AUTOMATION  
Vance, A. M.  
*Mining Congress Journal*, v. 47, pp. 60-64;  
(discussion) pp. 64-65, September 1961

- 2,480. A PNEUMATIC COMPUTER FOR  
PROCESS CONTROL—II  
Chapin, D. W.  
*ISA Journal*, v. 8, no. 10, pp. 53-55,  
October 1961

- 2,481. INTERLOCKING AIR CIRCUITS FOR  
RELIABLE SEQUENCING  
Taylor, W. J.  
*Hydraulics and Pneumatics*, v. 14,  
pp. 80-88, October 1961

- 2,482. OPPOSED-BELLOWS PNEUMATIC  
SERVO CONTROL  
*Product Engineering*, v. 32,  
pp. 114-115, November 13, 1961

- 2,483. SOLID-STATE SYSTEM TO CONTROL  
PIPELINE  
*Oil and Gas Journal*, v. 59, pp. 207, 209  
November 20, 1961

- 2,484. CONTINUOUS PATH MACHINE TOOL  
CONTROL SYSTEM USING COARSE  
OPTICAL GRATINGS  
Davies, B. J.  
*Machinery*, London, v. 99, no. 2558,  
pp. 1211-1214, November 22, 1961

The principle of operation is given, and an explanation of a block diagram of one axis of a three-axis continuous path control system which incorporates a measuring system is described. A velocity command signal is discussed. Provision is made for performing various auxiliary functions, by means of additional signals on tape. (*EI*, 1961)

- 2,485. HOW TO CONTROL AIR CYLINDER  
SPEED AND IMPACT  
Brady, P. L.  
*Hydraulics and Pneumatics*, v. 14, pp. 84-85,  
November 1961

- 2,486. COMPUTER INVESTIGATION OF TWO  
IMPORTANT CRITERIA FOR ADAPTIVE  
CONTROL SYSTEMS  
Bruns, R. A.  
November 1961  
Jet Propulsion Laboratory, California  
Institute of Technology, Pasadena  
TR 32-191

- 2,487. AUTOMATIC SWITCHING CONTROL  
WITH ELECTRIC CLUTCHES  
AND BRAKES  
Block, P., Hennings, D.  
*Electro-Technology*, v. 68, pp. 84-92,  
December 1961

- 2,488. AUTOMATIC CONTROLS FOR  
MATERIALS HANDLING  
Carliss, O. S.  
*Modern Materials Handling*,  
v. 16, pp. 74-77, December 1961

- 2,489. AN APPROACH TO ADAPTIVE PROCESS CONTROL  
Marcus, R. H., Hougen, J. O.  
American Institute of Chemical Engineers,  
New York, N.Y.  
Preprint 112, presented at the AIChE 54th Annual Meeting, December 1961
- 2,490. CONTROLLING MOTION WITH ELECTRIC CLUTCHES AND BRAKES  
Pech, J. F.  
*Automation*, v. 8, pp. 69-78, December 1961
- 2,491. OPTIMAL CONTROL FOR STOCHASTIC AND ADAPTIVE PROCESSES  
Peterson, E. L.  
December 1961  
General Electric Company, Schenectady, N.Y., Paper
- 2,492. A STATISTICAL MEASURE OF THE EFFECTIVENESS OF ADAPTATION IN CONTROL SYSTEMS  
Nesbitt, R. A.  
*1961 IRE International Convention Record, Part 4—Automatic Control, Circuit Theory, and Information Theory*, pp. 18-24, 1961
- 2,493. ADAPTIVE SYSTEM USING PERIODIC ESTIMATION OF PULSE TRANSFER FUNCTION  
Bigelow, S. C., Ruge, H.  
*1961 IRE International Convention Record, Part 4—Automatic Control, Circuit Theory, and Information Theory*, pp. 25-38, 1961
- Insight into behavior of a plant adaptive control system is obtained by means of experimental simulation using a general purpose digital computer. Results show that while this adaptive system performs very well under certain limitations on the nature of the process controlled, it is not as generally applicable as expected. (*EI*, 1961)
- 2,494. ADAPTIVE CONTROL PROCESSES: A GUIDED TOUR  
Bellman, R. E.  
Princeton University Press, Princeton, N.J., 1961
- 2,495. SYNTHESIS OF OPTIMUM CONTROL SYSTEMS  
Chang, S. S. L.
- McGraw-Hill Book Co., Inc., New York, N.Y., 1961
- 2,496. ANALYSIS OF NONLINEAR CONTROL SYSTEMS  
Graham, D., McRuer, D.  
John Wiley and Sons, Inc., New York, N.Y., 1961
- 2,497. DYNAMIC OPTIMIZATION AND CONTROL, A VARIATIONAL APPROACH  
Kipiniak, W.  
John Wiley and Sons, Inc., New York, N.Y., 1961
- 2,498. COMPUTER CONTROL SYSTEMS TECHNOLOGY  
Leondes, C. T.  
McGraw-Hill Book Co., Inc., New York, N.Y., 1961
- 2,499. STABILITY IN NONLINEAR CONTROL SYSTEMS  
Letov, A. M.  
Adashko, J. G., Translator  
Princeton University Press, Princeton, N.J., 1961
- 2,500. INSTRUMENTATION FOR STABILIZATION AND OPTIMIZATION OF THE MONSANTO GENERALIZED CHEMICAL PROCESSING MODEL  
Mamzic, C. L., Skoluda, P. R.  
1961  
Moore Products Company, Philadelphia, Pa.  
Paper
- 2,501. ADAPTIVE CONTROL SYSTEMS  
Mishkin, E., Braun, L., Jr., Editors  
McGraw-Hill Book Co., Inc., New York, N.Y., 1961
- 2,502. STATISTICAL ANALYSIS AND OPTIMIZATION OF SYSTEMS  
Peterson, E. L.  
John Wiley and Sons, Inc., New York, N.Y., 1961
- 2,503. CYBERNETICS OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE  
Weiner, N.  
John Wiley and Sons, Inc., New York, N.Y., 1961

- 2,504. SYSTEMS ENGINEERING FOR THE PROCESS INDUSTRIES  
Williams, T. J.  
McGraw-Hill Book Co., Inc., New York, N.Y., 1961
- 2,505. SYNTHESIS OF QUASI-STATIONARY OPTIMUM NONLINEAR CONTROL SYSTEMS.  
Chandaket, P., Leondes, C. T.  
*AIEE, Transactions of the, Part II—Applications and Industry*, pp. 313-325, January 1962
- 2,506. SELF-ADAPTIVE SYSTEM WITH A VARIABLE-PARAMETER PROPORTIONAL-INTEGRAL-DIFFERENTIAL CONTROLLER  
Kaya, Y., Yamamura, S.  
*AIEE, Transactions of the, Part II—Applications and Industry*, pp. 378-386, January 1962
- 2,507. SELECT AUTOMATIC CONTROLS THAT MATCH NEEDS OF EACH WATER-TREATING PROCESS  
Di Biase, M.  
*Power*, v. 106, pp. 47-49, January 1962
- 2,508. FUNCTION GENERATOR RUNS SHAFT STRAIGHTENER  
Ovshinsky, H. C.  
*Control Engineering*, v. 9, p. 103, January 1962
- 2,509. ONE-AXIS HOT-GAS SYSTEM FOR ALL-PNEUMATIC CONTROL  
*Space/Aeronautics*, v. 37, no. 1, pp. 39-41, January 1962
- 2,510. HERSCHER DOME: PUSHBUTTON CONTROL OF THE UNDERGROUND STORAGE FACILITY  
Hedding, L. K.  
*Gas Age*, v. 129, pp. 25-29, February 1, 1962
- 2,511. PACKAGED PNEUMATIC PROGRAMMER PROVIDES VERSATILE CONTROL  
Walle, L. I.  
*Automation*, v. 9, pp. 71-76, February 1962
- 2,512. CAM AND SWITCH UNIT CONTROLS AIR-HYDRAULIC SYSTEM  
*Automation*, v. 9, p. 85, February 1962
- 2,513. ANALYZING NONLINEAR SYSTEMS WITH RANDOM IN-PUTS  
Pastel, M. P.  
*Control Engineering*, v. 9, pp. 113-117, February 1962
- 2,514. CENTRALIZED OPERATIONS CONTROL STREAMLINES CZECH MINES  
*Engineering and Mining Journal*, v. 163, p. 146, February 1962
- 2,515. AN ADAPTIVE LOGIC SYSTEM WITH GENERALIZING PROPERTIES  
Ridgway, W. C., III  
April 1962  
Stanford University, Stanford Electronics Labs., Calif.  
ITR for January-December 1961,  
TR-1556-1, SEL-62-040, ASD TDR-62-512,  
AF 33(616)-7726
- Conventional methods for the synthesis of switching functions require that each function be built up by the detailed interconnection of one or more basic elements. A method of realization is described which uses an adaptation of a general system of variable threshold devices. The desired function is realized by repeated application of extremely simple adaption rules which can be easily implemented. A single variable threshold element is discussed in detail. Systems of variable threshold elements are postulated and are shown to be capable of realizing a larger set of functions than the single element. Finally, a similarity criterion between inputs is defined, and certain system configurations are shown to classify an unknown input signal with the most similar known signal.
- 2,516. NOW, AUTOMATED TORQUE CONTROL  
DeVoss, E. A.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 127-128, May 14, 1962
- 2,517. REVIEW OF CONTROL DEVELOPMENTS  
Truxal, J. G.  
*IRE, Proceedings of the*, v. 50, pp. 781-786, May 1962

2,518. AUTOMATIC CONTROL AND  
ELECTRONICS

Chestnut, H.

*IRE, Proceedings of the*, v. 50, pp. 787-792,  
May 1962

2,519. PAPERS ON ADAPTIVE SYSTEMS

Widrow, B., Franklin, G. F., Compilers

May 1962

Stanford University, Stanford Electronics Labs.,  
Calif.

TR-2104-2, SEL-62-003, Nonr 225(24),  
NR 373 360

The following papers by Stanford students are presented: "Decision Making with Strategy Improvement in Repeated Games", "An Adaptive Game Player for  $2 \times 2$  Zero-Sum Games", "Adaptive Threshold Logic", "A Bio-adaptive System: An Artificial Pancreas", "Analysis and

Design of an Adaptive System for Optimizing System-Frequency Response", and "Memory in Adaptive Systems".

2,520. NUMERICAL POSITIONING CONTROL  
SYSTEM

*Machinery*, v. 68, p. 149, May 1962

2,521. REMOTE CONTROL OF LIGHTHOUSES

*Electronic Engineering*, v. 34, p. 315, May 1962

2,522. COMPUTER CONTROLS BILLET CUTS

*Iron Age*, v. 189, p. 166, June 21, 1962

2,523. AUTOMATIC CONTROL FUNDAMENTALS

Lloyd, S. G.

*Automation*, v. 9, pp. 86-90, June 1962;  
pp. 84-90, July 1962

## HUMAN TIME LAG AND HUMAN FACTORS IN CONTROL

- 2,524. ON THE INFLUENCE OF THE TIME FACTOR ON SPATIAL PERCEPTION

Hertel, K., Monjé, N.

*Pflüeger's Archiv für die Gesamte Physiologie*, v. 249, pp. 295-306, 1947 (in German)

A system of three parallel rods is shown to the subject for varied periods of time. Their spatial order can be recognized only when the rods form a specific angle with the connective line of the subject's eye midpoint. The graphic illustration of the relationship between size of the angle and time is interpreted as the intensity time curve and may be compared to the stimulus time tension curve. Both are in the shape of a hyperbole. Time values may be read analogous to the chronaxie. (*PsyA*, 1949, #5980)

- 2,525. THE RELATIONSHIP OF VERBAL REACTION TIME TO HEMISPHERE OF ENTRY OF A VISUAL STIMULUS [ABSTRACT]

Jones, M. H., Jones, F. N.

*American Psychologist*, v. 2, pp. 408, 1947

- 2,526. REACTION TIME OF MALE HIGH SCHOOL STUDENTS IN 14-17 YEAR AGE GROUPS

Atwell, W. O., Elbel, E.R.

*Research Quarterly of the American Association of Health, Physical Education, and Recreation*, v. 19, pp. 22-29, 1948

This study reports the results obtained on male high-school students in an attempt to determine whether a significant difference in simple reaction time exists between different age groups. (*PsyA*, 1948, #3361)

- 2,527. THE TIME ERROR IN VISUAL PERCEPTION

Nowlan, E. H.

1948

Harvard University, Cambridge, Mass.  
Thesis

- 2,528. A STUDY OF REACTION TIME TO LIGHT AND SOUND AS RELATED TO INCREASED POSITIVE RADIAL ACCELERATION

Canfield, A. A., Comrey, A. L., Wilson, R. C.

*Journal of Aviation Medicine*, v. 20, pp. 350-355, 1949

Positive acceleration forces of 1, 3, and .5 g were used. Reaction times to sound were shorter than to light. Both types of reaction time increased significantly with increased acceleration. The correlation of test results with different subjects and under different test conditions was high.

- 2,529. THE HUMAN TIME FACTOR IN FLIGHT: THE LATENT PERIOD OF OPTICAL PERCEPTION AND ITS SIGNIFICANCE IN HIGH SPEED FLYING

Strughold, H.

*Journal of Aviation Medicine*, v. 20, pp. 300-307, 1949

The latent period of perception is the time between stimulation and the beginning of perception. For the eye this period ranges between about 35 and 150 msec. In supersonic flight the perceptual latent period produces a distance scotoma of 100 m. This means that when an object is "seen" 100 m ahead, it is actually abreast of the eye. Other implications for supersonic flying are discussed. (*PsyA*, 1950, #3041)

- 2,530. SOME RELATIONS BETWEEN OPTICAL RESOLUTIONS AND RESPONSE

Bartley, S. H.

*American Journal of Optometry and Archives of American Academy of Optometry*, v. 27, pp. 333-344, 1950

Two experiments are reported, the first concerning effects of distance of observation and duration of exposure on accuracy of observation, the second comparing reaction time and accuracy. The latter factor was calculated from the percentage of times that the line test object was reported in its actual orientation. Mean reaction time increased with distance of observation, but variations were considerable and the basic reaction times of the two observers were quite different. (*PsyA*, 1951, #148)

- 2,531. PERCEPTUAL ANTICIPATION AND REACTION TIME

Poulton, E. G.

*Quarterly Journal of Experimental Psychology*,  
v. 2, pp. 99-112, 1950

The effect of perceptual anticipation on reaction time was studied under two conditions. In the first, the response had to be varied at a given point which followed a variable time interval. In the second, the subjects reacted to two auditory signals separated by variable time interval, the second one being expected or unexpected. Lengthened reaction time or lack of readiness to respond was found to be due to a lack of preparation or the inability to prepare for the signal. Preparation for reacting to the second of two stimuli, when both are expected and reacted to, takes from 0.2 to 0.4 sec. Results are interpreted to terms of a foreperiod in which the subject prepares for the response rather than to a psychological refractory phase. (*PsyA*, 1952, #135)

**2,532. BATTING REACTION TIME**

Slater-Hammel, A. T., Stumpner, R. L.

*Research Quarterly of the American Association for Health, Physical Education, and Recreation*,  
v. 21, pp. 353-358, 1950

An attempt to measure batting reaction time under two experimental conditions is reported. Starting reaction time was measured by the speed with which the subject could start a bat moving upon the presentation of a visual stimulus. Movement reaction time was measured by the speed with which the subject could change direction of a moving bat upon the presentation of a visual stimulus. It was found that the mean starting reaction time was approximately 0.21 sec and the mean movement reaction was 0.27 sec. (*PsyA*, 1951, #5993)

**2,533. MOTION AND PERCEPTION OF SPACE**

Hartinger, H.

1951

Air Force School of Aviation Medicine,  
Brooks AFB, Texas  
Unnumbered Special Report

Hartinger discusses in theoretical terms the influence of the time delay in perception on the interpretation of space, the perceived movement of objects, and the perceived distortion of shapes. Formulae are derived for these various effects. (*PsyA*, 1952, #5306)

**2,534. CHOICE BATTING REACTION TIME**

Slater-Hammel, A. T., Stumpner, R. L.

*Research Quarterly of the American Association for Health, Physical Education, and Recreation*,  
v. 22, pp. 377-380, 1951

The choice batting reaction time of twenty-five physical education majors was measured under two experimental conditions. It was found that the mean choice starting reaction time was approximately 0.29 sec and the mean choice movement reaction time was 0.34 sec. (*PsyA*, 1952, #3834)

**2,535. REVIEW OF THE LITERATURE ON REACTION TIME**

Katchmar, L. T.

March 16, 1952

Maryland, University of, College Park  
Technical Report 5 on Indicators of Behavior Decrement, DA 49-007-md-222  
AD-31,305

**2,536. INVESTIGATIONS ON THE SPEED OF VISUAL PERCEPTION: SPEED OF PERCEPTION FOR MOVING PICTURES IN SEVERAL NEURO-PSYCHIATRIC CONDITIONS**

Fasanaro, G.

*Acta Neurologica*, Naples, v. 7, pp. 323-331, 1952 (in Italian)

(See also *Ophthalmic Literature*, v. 6, no. 7, p. 887, Abstract #4763, 1954)

**2,537. STUDIES ON THE SPEED OF VISUAL PERCEPTION: INFLUENCE OF VESTIBULAR STIMULATION ON THE SPEED OF VISUAL PERCEPTION**

Fasanaro, G., Vetrano, G.

*Acta Neurologica*, Naples, v. 7, pp. 645-661, 1952 (in Italian)

(See also *Ophthalmic Literature*, v. 6, no. 7, p. 887, Abstract #4764, 1954)

**2,538. ON THE RATE OF GAIN OF INFORMATION**

Heck, W. E.

*Quarterly Journal of Experimental Psychology*, v. 4, pp. 11-26, 1952

Methods of information theory were applied to (1) a conventional choice reaction experiment with various numbers of alternatives up to ten and with a negligible proportion of errors, and (2) a ten-choice experiment in which the subjects deliberately reduced their reaction times by allowing themselves various proportions of errors. Information is definitely related to reaction time within the duration of one perceptual motor act and has

a value of the order of five "bit" per second. Further evidence in terms of the distribution of reaction times is discussed. (*PsyA*, 1952, #6790)

**2,539. REMOTE ACTION POTENTIALS AT THE MOMENT OF RESPONSE IN A SIMPLE REACTION TIME SITUATION**

Henderson, R. L.

*Journal of Experimental Psychology*, v. 44, no. 4, pp. 238-241, 1952

Action potential measurements were taken from a non-participating body member of a group of 20 subjects responding in a simple reaction time situation to a visual stimulus. The reaction time was found to decline steadily over a period of six successive practice days of 100 trials each. The action potential during the foreperiod and at the moment of the response was found to decline during the first four days of practice, then the rise on the fifth and sixth days. Although the terminal rise in action potential was not statistically significant, a tentative hypothesis was advanced which explains the rise in terms of increased motivation to improve as the asymptote of learning is reached. (*BA*, 1954, #10,234)

**2,540. INDEPENDENCE OF REACTION AND MOVEMENT TIMES. AN EQUIVALENCE OF SENSORY MOTIVATORS OF FASTER RESPONSE**

Henry, F. M.

*Research Quarterly of the American Association for Health, Physical Education, and Recreation*, v. 23, pp. 43-53, 1952

Two basic problems are investigated: (1) the relationship between individual differences in reaction time and speed of movement, and (2) the role of sensory stimuli that function to improve speed of action when administered to the subject during the slower half of his responses to a reaction signal. Using the ball snatch coordination test on one group and the treadle press test on another, it was found that all groups were significantly improved in reaction time, and most of them in movement time by whatever motivating stimulus they received. This improvement is considered due to informative rather than punitive value of the stimulus. (*PsyA*, 1953, #1960)

**2,541. PERCEPTION AND WUNDT'S D REACTION**

Riche, C. V., Jr.

*Perceptual and Motor Skills Research Exchange*, v. 4, pp. 81-87, 1952

Twenty-four subjects practiced with four complex percepts, two simple percepts, and a reaction time stimulus, in an experimental comparison of simple reaction time and perception, defined as latency of recognition response to relatively ambiguous and unstructured material. A significant difference was found between both the complex and the simple percepts and the simple reaction time. Differences produced by speed vs. accuracy instructions were negligible. It was concluded that perception as defined must be some form of recognition response different from a simple reaction. (*PsyA*, 1954, #2179)

**2,542. REACTION TIME AND SPEED OF MOVEMENT**

Slater-Hammel, A. T.

*Perceptual and Motor Skills Research Exchange*, v. 4, pp. 110-113, 1952

Measurement of reaction time to light and speed of arm movement over an arc of 120 deg were obtained from twenty-five male physical education students. Mean reaction time was 0.224 sec. Mean duration of movement was 0.238 sec. Correlations of reaction time with several measures of movement ranged between -0.07 and +0.17, not significantly different from 0. The results of this study are interpreted as simply indicating that measurement of reaction time cannot readily be used to predict speed of movement. (*PsyA*, 1954, #5549)

**2,543. VISUAL REACTION TIME IN THE ALPHA RHYTHM. AN INVESTIGATION OF A SCANNING HYPOTHESIS**

Walsh, E. G.

*Journal of Psychology*, v. 118, pp. 500-508, 1952

The visual reaction time to photopic and scotopic stimuli was measured. Fluctuations of reaction time did not appear to depend upon the amplitude or phase of the alpha rhythm at the moment of stimulation. A scanning theory of visual reaction time is discussed. (*PsyA*, 1954, #371)

**2,544. TIMING**

Conrad, R.

February 1953

Applied Psychology Research Unit, Cambridge, Great Britain

Report APU 188/53

AD-22,138

A discussion is presented concerning the relation between time and human behavior, time as an experimental variable, reaction time theory in the study of skill, and the effect of time on timing.

- 2,545. HUMAN ENGINEERING; A SELECTED BIBLIOGRAPHY AND A GUIDE TO THE LITERATURE [REVISED EDITION]  
August 1953  
Armed Services Technical Information Agency Reference Center, Library of Congress, Washington, D.C.  
ARC 426U  
AD-16,709

A total of 395 references is included.

- 2,546. STIMULUS INFORMATION AS A DETERMINANT OF REACTION TIME  
Hyman, R.  
*Journal of Experimental Psychology*, v. 45,  
pp. 188-196, 1953

The information conveyed by stimulus was varied in three ways: (1) the number of equally probable alternatives from which it could be chosen; (2) the proportion of times it could occur relative to the other possible alternatives; and (3) the probability of its occurrence as a function of immediately preceding stimulus presentation. The reaction time to the amount of information in the stimulus produced a linear regression for each of the three ways. (*PsyA*, 1954, #412)

- 2,547. THE USE OF EVENT TIMES AS A DESCRIPTION OF SYSTEMS OPERATION  
Isaac, E. J.  
February, 1954  
Tufts University, Medford, Mass.  
Report 1954-494-03-10, Nonr-49403  
AD-109,606

Symbolic models ordinarily used to describe the operation of complex man-machine systems fall roughly into three categories: functional, conditional probability, and simulation. While functional and conditional probability models are closely related, a wide gap lies between the conditional probability model and the simulation model. This report defines a class of models specifically designed to bridge this gap. The description of the system operation is in terms of the times of occurrence of events. The elements of the formulations are the probability distributions of the time lags between events, and these time lags are related to the physical parameters of the system. Three operations are permitted with the distribution: maximum, minimum, and blocking. These operations are used in either a modified lattice form or in an algebraic

form to construct the models. Two detailed examples of military systems are given. One demonstrates the Monte-Carlo examination of an event-time model to determine the sensitivity of a system to a parameter change. The other illustrates the relation between an event-time model and a digital-computer simulation of the same system. The derivations of time-lag distributions for detection devices on the basis of detection criteria and a recursive computation schema for examining event-time models are included in the appendix. (ASTIA)

- 2,548. A SURVEY OF THE MATHEMATICAL THEORY OF TIME-LAG, RETARDED CONTROL, AND HEREDITARY PROCESSES  
Bellman, R., Danskin, J. M., Jr.  
March 1, 1954  
Rand Corp., Santa Monica, Calif.  
Report R-256, W33-038-ac-14105, Project Rand  
AD-68,786

Mathematical techniques are summarized which are required in the treatment of physical phenomena involving time lags, retarded control, or hereditary effects. The functional equations which arise are no longer the differential equations of classical mathematical physics, but rather differential-difference equations, integro-differential equations, and equations of even more complicated form. The most important applications of the mathematical theory arise in connection with control problems and the resulting stability investigations. Questions involving these advanced methods arise in the theory of guided missiles and pilotless aircraft. It is here that the tremendous velocities, which are now feasible, make the time lags created by the control mechanism of great significance. In many cases it is impossible even to understand the origin of various instability phenomena without taking into account time lags and retarded control. For this reason these ideas are becoming of increasing importance in the field of servomechanisms and automatic control. Equations of this form also play an important role in mathematical economics where the analysis of inter-industrial processes requires an awareness of the fact that some changes cannot occur instantaneously. Other physical phenomena requiring these concepts occur in the theory of magnetism, in the theory of elasticity and plasticity, and throughout the theory of fission processes. In the field of biology, these ideas are required to explain mutation and, in general, the growth of unicellular organisms. In the field of psychology, they are necessary for any treatment of learning theory and other long-term effects, such as mental breakdowns. (ASTIA)

- 2,549. SOME HUMAN FACTORS IN THE DESIGN OF CONTROLS: AN EVALUATION OF THE LITERATURE  
Godwin, A. C., Wallis, D.  
October 1954  
Naval Motion Study Unit, Great Britain  
NMSU Report 61  
AD-82,394

This report attempts to bring up to date and expand the summary issued in 1948 by K. F. H. Murrell (NMSU Report 36). An attempt is also made to evaluate some of the research data and recommendations which appear in the literature, pointing out also where some of the gaps in our knowledge lie. No endeavor is made to discuss the intricacies of control mechanisms themselves. The object has been to give an account of the more relevant human factors which have been shown to influence performance through the design of cranks, joysticks, and other control handles commonly found in association with closed- or open-loop systems. 47 references.

- 2,550. A MATHEMATICAL ANALYSIS OF THE HUMAN OPERATOR IN A CLOSED-LOOP CONTROL SYSTEM  
Walston, C. E., Warren, C. E.  
December 1954  
Ohio State University, Research Foundation, Columbus  
Research Bulletin Report AFPTRC-TR-54-96, AF 33(038)-10528  
AD-62,105

- 2,551. IDENTIFICATION OF VISUAL PATTERNS AS A FUNCTION OF INFORMATION LOAD  
Archer, E. J.  
*Journal of Experimental Psychology*, v. 48, pp. 313-317, 1954

It was found that time to respond increases as a linear function of relevant information load, but that this response time is independent of the amount of irrelevant information. (*PsyA*, 1955, #5087)

- 2,552. EFFECT OF FLASH AND FIELD LUMINANCE UPON HUMAN REACTION TIME  
Bartlett, N. R., Macleod, S.

*Optical Society of America, Journal of the*, v. 44, no. 4, pp. 306-311, 1954

Reaction time was taken between presentation of test flash in subjects opening a microswitch. Tests were made with both foveal test spots and peripheral test spots. Reaction time lengthens with decreasing luminance of test flash and increases more abruptly when flash luminances are held constant and field luminances increased. Peripheral stimulation yields shorter reaction time than foveal for a dim flash, but foveal is the quicker for a bright flash. An equation for the results is given. (*BA*, 1955, #21,363)

- 2,553. THE EFFECT OF WORK INVOLVING PERCEPTUAL ATTENTION UPON CERTAIN BIOLOGICAL CONSTANTS  
Sautrel, M., Petit, R., Mazaraki, C.  
*Bulletin du Centre d'Etudes et Recherches Psychotechniques*, v. 3, no. 2, pp. 24-33, 1954

It is hypothesized that prolonged perceptual attention produces (1) a delay in visual reaction time, and (2) an acceleration of the heart beat. Experimental results confirmed only the second hypothesis. (*PsyA*, 1955, #4809)

- 2,554. RECENT STUDIES OF SIMPLE REACTION TIME  
Teichner, W. H.  
*Psychological Bulletin*, v. 51, pp. 128-149, 1954

An assessment is made of the current scientific status of simple reaction time based primarily on a literature review of the last twenty years. Considered are the effects on reaction time of stimulus receptor factors, of central and motor factors, and of special factors such as prolonged readiness, certain common drugs, temperature, sleep conditions, etc. 163 references. (*PsyA*, 1955, #374)

- 2,555. REACTION TIME AS A FUNCTION OF MANIFEST ANXIETY IN STIMULUS INTENSITY  
Wenar, C.  
*Journal of Abnormal and Social Psychology*, v. 49, pp. 335-340, 1954

Results indicated that both an increase in manifest anxiety and an increase in stimulus intensity were effective in increasing the speed of reaction during training, and in raising the height of the temporal gradient of response strength. 17 references (*PsyA*, 1955, #3565)

2,556. EFFECT OF EXPONENTIAL TYPE  
CONTROL LAGS ON THE SPEED AND  
ACCURACY OF POSITIONING A  
VISUAL INDICATOR

Warrick, M. J.

June 1955

Wright Air Development Center, Aero-Medical  
Lab., Wright-Patterson AFB, Ohio

Report on Human Engineering Controls and  
Controller Devices, WADC TN 55-348

AD-99,520

There is inherent in many controller systems a lag between the time that an operator positions his control and the time that the corresponding effect is achieved. Very frequently this lag approximates an exponential function. The present investigation was conducted to determine what effect, if any, such controller system lags have on the human operator's ability to position a visual indicator rapidly and accurately. Twenty subjects were used in this experiment. Each subject repeatedly set a pointer to a fixed reference position by means of a rotatable control knob. Exponential lags of 0, 40, 120, 360 and 1000 msec were introduced between the control and display. On the basis of the experimental findings it is concluded that any amount of exponential lag reduces the speed and accuracy of setting the pointer. The longer the lag the more pronounced is the effect. However, it appears that the human operator does modify his behavior somewhat so as to compensate to a limited extent for an increased lag. (ASTIA)

2,557. A NOTE ON REACTION TIMES DURING  
A DIFFICULT TRACKING TASK

Day, R. H.

*Australian Journal of Psychology*, v. 7,  
pp. 135-139, 1955

As a result of display variation, changes were noted in performance on the primary (tracking) component of the complex task. No changes were observed, however, in reaction times score on the secondary component. These findings are consistent with the results of an earlier study. (*PsyA*, 1957, #513)

2,558. DECISION-TIME AND  
PSYCHOLOGICAL DISTANCE

Dember, W. N. (University of Michigan,

Ann Arbor, 1955, Thesis)

*Dissertation Abstracts*, v. 15, p. 632, 1955

2,559. EFFECT OF HEAT STRESS ON SERIAL  
REACTION TIME IN MAN

Fraser, D. C., Jackson, K. F.

*Nature*, v. 176, no. 4490, pp. 976-977, 1955

Data on seven subjects over a five-day period are included. (*BA*, 1956, #13,599)

2,560. DISCRIMINATION REACTION TIME AS  
A FUNCTION OF ANXIETY  
AND INTELLIGENCE

Grice, G. R.

*Journal of Abnormal and Social Psychology*,  
v. 50, pp. 71-74, 1955

While the low anxiety group was superior in performance on the reaction time task, it was found that this superiority could be attributed to intellectual differences rather than to differences in levels of anxiety.

2,561. THE ALPHA RHYTHM AND RATE OF  
VISUAL PERCEPTION. PRELIMINARY  
INVESTIGATION

Mundy-Castle, A. C.

*National Institute for Personnel Research*,  
*Journal of the*, v. 6, pp. 38-43, 1955

An investigation of the scanning hypothesis of a relationship between perception rate and alpha frequency revealed significant correlation between: high alpha frequencies and number of geometric figures accurately perceived, and high alpha frequencies in number of such figures subsequently recognized. No correlation was found between alpha frequency and number perceived as circles or letters enclosed by circles. (*PsyA*, 1956, #2052)

2,562. REACTION TIME TO LIGHT STIMULAE  
IN THE PERIPHERAL VISUAL  
FIELD

Slater-Hammel, A. T.

*Research Quarterly of the American Association  
for Health, Physical Education, and Recreation*,  
v. 26, pp. 82-87, 1955

An investigation in which twenty-five male physical education majors were given the opportunity to respond to light stimuli placed along seven points in the visual field, gave evidence that (1) reaction time increased as the distance of the response stimulus increased from direct vision, (2) the direction of the response stimulus from direct vision was not a significant variable, and (3) reaction time to response stimuli directly perceived

provided an excellent relative index to reaction speed to stimuli indirectly perceived. (*PsyA*, 1956, #470)

- 2,563. **A HUMAN ENGINEERING BIBLIOGRAPHY**  
McCollom, I. N., Chapanis, A.  
November 1956  
San Diego State College, Calif. (in cooperation  
with Johns Hopkins University, Baltimore, Md.)  
TR 15, Nonr-126801  
AD-122,248

Covered in this report are: general references, methods, facilities, and equipment; man-machine systems; visual problems; auditory problems; speech communication; other sensory input channels; comparison and interaction among sensory input channels; the design of controls and integration of controls with displays; control systems; design and layout of workplaces, equipment, and furniture; body measurements and movements; higher mental processes; simulators and proficiency measuring devices; environmental effects on human performance; behavioral efficiency, fatigue, and human capacities; and operator characteristics for specific jobs. 5655 references. (ASTIA)

2,564. **FINAL REPORT**

McCollom, I. N.  
December 1, 1956  
San Diego State College, Calif.  
Final Report, Nonr-126801  
AD-118,905

Work involved in compiling a human-engineering guide for equipment design is outlined. Bibliographies, abstracts, translations, experimental studies, and special reports in the following areas are cited: (1) comparison and interaction among sensory input channels; (2) disorientation; (3) effect on human performance of acceleration, motion, and vibration; (4) effect on human performance of ventilation, temperature, and humidity; (5) man-machine integration; (6) motion sickness and therapeutic drugs; (7) simulators and proficiency measuring devices; (8) speech communication; (9) systems considerations; and (10) work and fatigue. 24 references.

- 2,565. **INFORMATION MEASUREMENT AND REACTION TIME: A REVIEW**  
Bricker, P. D., Quastler, H.  
In "Information Theory and Psychology,"  
pp. 350-359  
The Free Press, Glencoe, Ill., 1956

Six experimental studies on the relation between reaction time and the informational content of the stimulus are reviewed. In particular, the slope and intercept constants obtained by the various experimenters are compared. It is concluded that reaction time measurements are useful tools for studying subjective information functions.

- 2,566. **EFFECTS OF ANXIETY, STRESS, AND TASK VARIABLES ON REACTION TIME**  
Farber, I. E., Spence, K. W.  
*Journal of Personality*, v. 25, pp. 1-18, 1956

Two experiments were run in an attempt to clarify the relations among manifest anxiety, experimentally induced stress, and various task variables in reaction time. The results offered no convincing evidence that variations in amounts of anxiety affected reaction time in any manner. The effect of experimentally induced stress was also unclear. (*PsyA*, 1957, #7224)

- 2,567. **THE EFFECT OF ORGANIZATION UPON COMPLEX REACTION TIME**  
Flores, I.  
*Journal of Psychology*, v. 41, pp. 301-313, 1956

Two fields, each of ten squares numbered 1-10, were presented to subjects who responded by pressing a square in the response field corresponding to the one in the stimulus field which had become lit. The purpose was to show that organization of either stimulus or response field, or both, in a complex situation would result in reduction of reaction time. This was demonstrated. In fact, a greater reduction in reaction time occurred when both fields were random and then organized than the sum of the reductions achieved when either field was separately organized. (*PsyA*, 1957, #4227)

- 2,568. **PERSONALITY DYNAMICS AND LEARNING: A STUDY OF INDIVIDUAL DIFFERENCES IN LEARNING, RETENTION, TRANSFER OF TRAINING AND SPEED OF REACTION AS FUNCTION OF PERSONALITY**  
Gochman, S. I. (New York University, N. Y.,  
1956, Thesis)  
*Dissertation Abstracts*, v. 16, no. 8, p. 1503, 1956

- 2,569. **TIME UNCERTAINTY IN SIMPLE REACTION TIME**  
Klemmer, E. P.

*Journal of Experimental Psychology*, v. 51, no. 3,  
pp. 179-184, 1956

Simple reaction-time tests on six subjects showed that reaction time increases with mean foreperiod above some optimum value less than one second and reaction time increases with foreperiod variability. In a sequence of trials the immediate foreperiod influences reaction time only if the previous foreperiod is different from it and then only slightly. The striking finding in all tests is that the important determiner of reaction time is not the immediate foreperiod, but rather the distribution of foreperiods within which it is imbedded.

- 2,570. ASSOCIATIVE REACTION TIME AS A FUNCTION OF FREQUENCY OF STIMULUS RESPONSE PAIRING AND NUMBER OF RESPONSE ALTERNATIVES  
Wiggins, J. S. (University of Indiana, Bloomington, 1956, Thesis)  
*Dissertation Abstracts*, v. 16, pp. 1948-1949, 1956

- 2,571. THE EFFECT OF POSITIVE ACCELERATION ON VISUAL REACTION TIME [ABSTRACT]  
Brown, J. L., Burke, R. E.  
*Journal of Aviation Medicine*, v. 28, no. 2,  
pp. 193-194, April 1957  
(Paper presented at the Aero Medical Association Meeting, Denver, Colo., May 6-8, 1957)

Two accelerations between 2 and 5.4 g, two luminances of signal (4360 and 0.025 mL), and two positions of retinal illumination were investigated. Results indicate that reaction time increases with acceleration. The lumiance level effected a change. The light positions did not affect the reaction time.

- 2,572. HUMAN FACTORS IN THE DESIGN OF SYSTEMS  
Sinaiko, H. W., Buckley, E. P.  
August 29, 1957  
Naval Research Laboratory, Washington, D.C.  
NRL Final Report 4996  
AD-143,053

The process of designing systems generally consists of three steps: (1) developing the system concept, (2) assigning system subtasks to component elements, and (3) deciding how to link the components together. Since each of these steps is influenced by certain human characteristics, information about man will be helpful to the design engineer.

The following ten general characteristics of man as a system component, together with their design implications, should be considered by the system designer: physical dimensions, capability for data sensing, capability for data processing, capability for motor activity, capability for learning, physical and psychological needs, sensitivities to social environment, sensitivities to physical environment, coordinated action, and differences among individuals. Effective use of humans in highly automatic systems can be made if these characteristics are considered.

The methodology of evaluation of man-machine systems is treated in two areas: general principles and cautions for doing human engineering tests, and the uses of statistics and experimental design. An extensive bibliography, representing the major areas of human engineering, is included. Finally, in an appendix, there is a checklist of human factors for the design engineers. (ASTIA)

- 2,573. HUMAN ENGINEERING BIBLIOGRAPHY, 1955-1956  
October 1957  
Tufts University, Institute for Applied Experimental Psychology, Medford, Mass.  
ONR Report ACR-24, Nonr-49413  
AD-149,950
- 2,574. REMOTE HANDLING OF RADIATION SOURCES: ENGINEERING PROBLEMS DISCUSSED WITH HUMAN ENGINEERING DEMANDS  
Wissel, J. W., Lee, J. C.  
*Electrical Engineering*, v. 76, pp. 1071-1074, December 1957

- 2,575. THE PSYCHOLOGICAL REFRACTORY PHASE  
Marill, T.  
*British Journal of Psychology* v. 48,  
pp. 93-97, 1957

A reaction time experiment was performed in which the subject was presented with two lights and two hand keys. A flash of the left light served as a stimulus to press the left key with the left hand; the right light, to press the right key with the right hand. Trials were given in which both lights flashed, the interval between flashes being randomly selected from nine possible values ranging from 0 to 600 msec, the various intervals occurring with equal probability. If  $s_1$  and  $s_2$  are the prior and subsequent of a pair of stimuli calling forth responses

$r_1$  and  $r_2$ , respectively, it was found: (1) that presenting  $s_2$  during the  $s_1$  minus  $r_1$  interval has no systematic effect on this interval; (2) that the  $s_2$  to  $r_2$  interval varies markedly as a function of the  $s_1$  to  $s_2$  interval with  $s_2$  to  $r_2$  longest for short  $s_1$  to  $s_2$ . (*PsyA*, 1958, #5036)

2,576. CONFLICT AND CHOICE TIME

Berlyne, D. E.

*British Journal of Psychology*, v. 48,  
pp. 106-118, 1957

Three experiments were carried out to test the effect of the following determinants of degree of conflict on choice reaction time: (1) the number, (2) the nearness to equality and strength, (3) the absolute strength, and (4) the degree of compatibility, of competing response tendencies. The principal findings were as follows: (1) both types of choice reaction times were longer when the number of alternative responses was increased, (2) free choice reaction times . . . , (3) forced choice reaction times were inversely related to stimulus intensity . . . , (4) degree of physiological incompatibility did not affect free choice reaction times . . . , and (5) there were no significant differences between the reaction times of subjects with high and low neuroticism scores. The results are discussed in the light of various theoretical models. 38 references. (*PsyA*, 1958, #5061)

2,577. EFFECTS OF FOREPERIOD INDUCED MUSCULAR TENSION AND STIMULUS REGULARITY ON SIMPLE REACTION TIME

Teichner, W. H.

*Journal of Experimental Psychology*, v. 53,  
pp. 277-284, 1957

It is found that foreperiod lengths and muscular tension are independent in their effects on reaction time. In general, reaction time varies inversely with magnitude of muscular tension. There appears to be an optimum fore-period of reaction which, in the present massed practice tasks, was 5 to 6 sec. No practice effects due to the repeated elicitation of the reaction were found. (*PsyA*, 1958, #3762)

2,578. EFFECTS OF SIZE AND SHAPE DIFFERENCES IN STIMULAE ON DISJUNCTIVE REACTION TIME

Wilson, K. V.

*Perceptual and Motor Skills*, v. 7, pp. 93-96, 1957

Disjunctive reaction times were obtained for stimulus pairs differing in size alone, in shape alone, and in combination of size and shape. Since one stimulus was identical in all pairs, it was possible to compare the trends in reaction times as a function of the area of the other stimulus. A rapid decreasing trend was found for the five pairs differing in shape and a less rapid trend was found for the five pairs differing in size. Reaction times for the four combinations of size and shape differences were generally lower than for the differences in size and shape alone, but no trend was found. (*PsyA*, 1958, #2534)

2,579. BIBLIOGRAPHY OF UNCLASSIFIED HUMAN ENGINEERING REPORTS [REVISION]

January 1, 1958

Naval Training Device Center,  
Port Washington, N.Y.

NAVEXOS P-149  
AD-204,768

These 429 unclassified reports are organized under the following broad subjects: learning, motor skills, perception, voice communications, extreme environmental factors, systems analysis, controls and displays, training devices, research tools, and general human engineering. The author, title, date of issue, and report number are included for each report. 451 references. (ASTIA)

2,580. INFLUENCE OF VOLUNTARY HYPERVENTILATION ON SIMPLE REACTION TIMES IN MAN

Rossanigo, F., Strollo, M.

*Rivista di Medicina Aeronautica*, v. 21, no. 1,  
pp. 68-75, January-March 1958 (in Italian with English summary)

The influence of voluntary hyperventilation on the response to light stimuli was investigated in ten subjects. The mean reaction time following light stimulation increased 17.6%, and the mean variance 71%. At the end of the experiment, results revealed subjective differences among the tested individuals.

2,581. ANNOTATED BIBLIOGRAPHY OF APPLIED PHYSICAL ANTHROPOLOGY IN HUMAN ENGINEERING

Hansen, R., Cornog, D. Y.

May 1958

H. L. Yoh, Co., Philadelphia, Pa.

Report, WADC 56-30, AF 33(616)2353  
AD-155,622

This volume contains condensations of 121 reports in the field of Applied Physical Anthropology. A majority of the annotations are grouped under three headings, Anthropometry, Biomechanics, and Comfort; a few are included in a general group. Working data and important illustrations are quoted directly from the original papers in most cases. A complete index is arranged by author as well as by subject. An additional list of reports (not annotated) is included as background material. Two appendices are also included containing relevant commentary on Seating Comfort and Anthropomorphic Dummies. 149 references. (ASTIA)

2,582. **HUMAN ENGINEERING BIBLIOGRAPHY, 1956-1957**  
October 1958  
Tufts University, Institute for Applied Experimental Psychology, Medford, Mass.  
ONR Report ACR-32, Nonr-49413  
AD-205,931

2,583. **HUMAN PERFORMANCE IN INFORMATION TRANSMISSION, PART VI: EVIDENCES OF PERIODICITY IN INFORMATION PROCESSING**  
Augenstine, L. G.  
December 1958  
Illinois, University of, Control Systems Lab., Urbana  
Report 75 (75-1), DA-36-039-sc-56695

This is the sixth and final report in a series dealing with man as an information transducer. The main interest of the Bio-systems Group in all of these studies has been to define man's capabilities in terms which are usually associated with the description of machines. In the present study an attempt has been made to specify some of the properties associated with data processing.

2,584. **PROJECTING MAN'S BRAIN INTO SPACE [ABSTRACT]**  
Mayo, A. M.  
*Aerospace Medicine*, v. 30, pp. 193-194,  
March 1959  
(Paper presented at Aero Medical Association Meeting, Los Angeles, Calif., April 27-29, 1959)

The control of remote devices by a human being can be made more effective and flexible by mentally placing himself in the vehicle he is controlling. Reprogramming automatic systems to take advantage of incoming data on a real time basis may be the key to safe and effective

probing of potentially dangerous situations. The operator of the system can be remotely positioned in an environment conducive to high mental efficiency, actual location being a function of the effectiveness of remote sensory and transmission systems. The effectiveness will be a function of the quality of the computation and display system providing him with decision making and functional data.

2,585. **TIME REQUIRED FOR DETECTION OF STATIONARY AND MOVING OBJECTS AS A FUNCTION OF SIZE IN HOMOGENOUS AND PARTIALLY STRUCTURAL VISUAL FIELDS**  
Miller, J. W., Ludvigh, E. J.  
May 26, 1959  
Kresge Eye Institute, Detroit, Mich.  
Naval School of Aviation Medicine, Pensacola, Fla.  
Report 15, Nonr-568(00), Joint Research Project NM 17-01-99

An investigation was made of the detection of stationary and moving objects in a homogeneous visual field. It was found, as expected, that the larger the objects the sooner they were detected. It was shown, however, that objects over six times threshold size required an average of 20 to 30 sec to locate. It is assumed that search is carried out in a series of discrete acts but that the total absence of visible detail prevents any systematic procedure from operating efficiently. The gross inefficiency of search is said to be the cause of the long acquisition times found. Probability functions were found to corroborate this hypothesis in that the experimental data did not fit the hypothesis incorporating the assumption of a systematic search. (AM, 1960, #212)

2,586. **THE ESTIMATION OF THE TRANSFER FUNCTION OF A HUMAN OPERATOR BY A CORRELATION METHOD OF ANALYSIS**  
Henderson, J. G.  
*Ergonomics*, v. 2, no. 3, pp. 274-286, May 1959

The transfer function of a human operator, acting as an element in a closed-loop control system, was determined experimentally by a method of analysis based on correlation functions. . . . The interesting features of the results are that the value of the time delay is fairly consistent and its average value is 0.16 sec. . . . (AM, 1960, #96)

2,587. TRANSPORTATION LAG: ANNOTATED BIBLIOGRAPHY

Weiss, R.

*IRE Transactions on Automatic Control*, v. AC-4,  
no. 1, pp. 56-64, May 1959

Many functions in control systems contain transportation lags. These include process control, control of thermal systems, rocket motor combustion, traveling waves, magnetic amplifiers, human link in control systems, high-speed aerodynamic control, and economic systems. An extensive bibliography is presented which lists and abstracts references dealing with this problem. 138 references. (EI, 1959)

2,588. A NUCLEAR GROUND SUPPORT EXPERIMENT WITH QUICK DISCONNECT DEVICES

Marjon, P. L.

June 29, 1959

Convair, Fort Worth, Texas

NARF-59-24T, MR-N-247, AF 53(600)-32054

An experiment in remote handling was conducted to provide information on equipment needs for ground support of nuclear aircraft. Representative, commercially available components with quick-operation features were used in remote handling tests. An evaluation was made of the causes of difficulties encountered in remote operations. Recommendations are made to guide the design of handling equipment for nuclear airplane maintenance applications. (NSA, 1959, #17,563)

2,589. THE ROLE OF PHYSICAL LIMITS IN MOTOR SKILLS

Gottsdanker, R.

August 17, 1959

Minneapolis-Honeywell Regulator Co., Minn.

MH Aero Document U-ED 6130

AD-235,170

This report applies to the fields of cybernetics, control systems, operation, human engineering, motion, test methods, physical fitness, positioning reactions, and motor reactions. The following subjects are covered: (1) the limits of reach, including normative data and reasonable limits; (2) the limits of strength, including normative data, comparative data and reasonable limits; and (3) speed of movement, including unidirectional motion, reciprocal motion, cranking, and reasonable limits. 31 references. (ASTIA)

2,590. THE SPEED AND ACCURACY OF DISCRETE ADJUSTMENTS

Gottsdanker, R.

August 18, 1959

Minneapolis-Honeywell Regulator Co., Minn.

MH Aero Document U-ED 6132

AD-235,171

This report applies to the fields of reaction time, motor reactions, test methods, human engineering, control knobs, control sticks, motion, operation, effectiveness, and control systems. The following subjects are covered: (1) the components of compound cycles of motion; (2) the patterning of simple motions, including classification of motions, description of phases, measurement of time-duration relationships, and range effect; and (3) factors in the effectiveness of operation, including required speed, extent and direction of motion, response unit, and static and mechanical properties of the control. 50 references. (ASTIA)

2,591. PERSONNEL VARIABLES IN THE ANALYSIS OF MAN-MACHINE SYSTEMS

Kurke, M. I.

*Ergonomics*, v. 2, no. 4, pp. 349-353, August 1959

2,592. BEHAVIOR IN CONTROLLING A COMBINATION OF SYSTEMS.

II. EFFECTS OF CHANGES IN THE VELOCITY OF DISTURBANCES

Jackson, K. F.

*Ergonomics*, v. 2, no. 4, pp. 363-366, August 1959

An experiment was performed to determine the effect of variation in the velocity of disturbance on the behavior of the operator in a continuous tracking task. The variably rotating pointers of four dials were controlled by sequential manipulation of four knobs, and the error, rate, and duration of manipulative movements were recorded. Results of the experiment indicated that the duration of interruptions, rate of working (in movements per trial), and the components of this rate (duration of control movements and change-over movements) were unaffected by changes in the velocity of rotation of the pointers. Errors occurring during interruptions and during control movements thus varied consistently with changes in the velocity of the disturbance. Although the variation in velocity of the pointer was not clearly perceived by the subjects, and thus no compensatory acceleration of the rate of performance was effected, this variation did produce changes in the amplitude and speed of control movements.

2,593. TIME, SPACE AND STEREOSCOPIC VISION, VISUAL FLIGHT SAFETY CONSIDERATIONS AT SUPERSONIC SPEEDS

Diamond, S. M. D.

*Aerospace Medicine*, v. 30, pp. 650-663,  
September 1959

Pilot reaction and the long time interval necessary for safe avoidance maneuver of modern aircraft are considered.

2,594. THE HUMAN BEING AS A LINK IN AN AUTOMATIC CONTROL SYSTEM. PART I

Higgins, T. J., Holland, D.B.

*IRE Transactions on Medical Electronics*,  
ME-6, no. 3, pp. 124-133, September 1959

Formulation of the human operator's performance as a control element that the engineer can profitably use in the over-all design of a control system incorporating a human element is discussed. The human operator samples the stimulus data in relation to previous feedback data, then for a period of approximately 0.15 to 0.3 sec acts and monitors his decision. In addition, the human control characteristic is definitely closed-loop, and the loop is closed only after the decision is made and during the corrective action period. The neuromuscular load portion of the control system has a time lag which may vary from approximately 40 to 400 msec, depending upon the inertia of the load at the point of application of manual control and the velocity needed to perform the control function. The human operator has definite thresholds for both input and feedback stimuli, and he must not be required to function with a bandwidth of more than 3 rad/sec if reliable and accurate operation is desired. Bearing in mind that the operator functions most effectively when required to provide the least compensation, the system designer must provide the human operator with ample knowledge of the system response resulting from his action. (AM, 1960, #222)

2,595. HUMAN ENGINEERING BIBLIOGRAPHY

1957-1958

October 1959

Tufts University, Institute for Applied Experimental Psychology, Medford, Mass.  
Report ACR-43, Nonr-49413

AD-235,970

Personnel responsible for the human factors considerations in the design and development of equipment have a major need for rapid and easy access to the literature

pertinent to their work. The fact that the literature associated with human engineering derives from some 490 different journals and periodicals as well as a host of publications from governmental, industrial, and academic laboratories presents a compelling requirement for the development of useful bibliographic aids. This bibliography is divided into five main parts: (1) a topical outline which defines over 300 topic headings established for this bibliography, (2) an index which associates the approximately 1400 bibliographic entries with the topic headings; (3) an alphabetical index of the common search terms which would aid those using this bibliography but who are unfamiliar with the topic headings, (4) an annotated bibliography of some 1400 citations, and (5) an index of the authors of these citations. 1570 references. (ASTIA)

2,596. DOCUMENTATION INDEX AND BIBLIOGRAPHY FOR STUDY ON HUMAN ENGINEERING OF CONTROL SYSTEMS

November 17, 1959

Minneapolis-Honeywell Regulator Co., Minn.  
MH Aero Report 1508-TR1  
AD-235,165

This report applies to the following fields: human engineering; control systems; cockpits; display systems; reaction time; pilots; positioning reactions; motor reactions; flight instruments; instrument panels; and tracking. 356 references. (ASTIA)

2,597. SELECTED BIBLIOGRAPHY OF HUMAN FACTORS REPORTS

Huntington, J. M.

November 25, 1959

Minneapolis-Honeywell Regulator Co., Minn.  
MH Aero Document U-ED 6147  
AD-235,175

This report applies to the following fields: human engineering; aviation personnel; flight instruments; learning; job analysis; control systems; display systems; flight simulators; cockpits; positioning reactions; anoxia; vertigo; and space flight. 93 references. (ASTIA)

2,598. IMPROVEMENTS IN OR RELATING TO A HAND GRIP DEVICE FOR THE OPERATION OF REMOTE HANDLING MECHANISMS

Orr, D.

December 16, 1959

U.S. Department of Commerce, Washington, D.C.  
British Patent 825,552 (assigned to United Kingdom Atomic Energy Authority)

A handle for a remote manipulating device is described. The handle provides for moving a long rod in a tube or fixing its position at a desired place. (NSA, 1960, #6481)

2,599. MAN AS A CONTROLLER OF FLIGHT VEHICLES

Stewart, W. K.

*Royal Institution of Great Britain, Proceedings of the*, v. 37, pt. 5, no. 169, pp. 512-523, 1959

The common physiological problems of human piloting are reviewed. Emphasis is also placed on the psychological implications of the pilot-instrument system relationship, in which reaction time and the role of fatigue are primary factors. (AM, 1960, #271)

2,600 A SURVEY OF OPERATIONS AND SYSTEMS RESEARCH LITERATURE

Raben, M. W.

January 1, 1960

Tufts University, Institute for Applied Experimental Psychology, Medford, Mass.  
Report, Nonr-49413  
AD-233,505

This report applies to the fields of operations research, automation, human engineering, cybernetics, group dynamics, information theory, communications theory, games theory, computers, transportation, air traffic control systems, communication systems, production, and maintenance. The following subjects are covered: (1) capacities of man and machine, including comparison of man and machine, and automation; (2) methods of experimental and engineering psychology, including a general experimental method, engineering psychology, cybernetics, and methods for studying group processes; (3) operations and systems research methods in general; (4) communication and information theory, including the human link in communications systems; (5) game or decision theory and linear programming; (6) computers and simulation; (7) queueing theory and work measurement techniques; (8) man as a system component; (9) groups as system components, including groups structure and task, and interpersonal factors; (10) communication problems; (11) transportation problems, including air, ground, and ocean transportation systems; (12) air traffic control; and (13) production, maintenance and supply problems. 1026 references. (ASTIA)

2,601. MAN-MACHINE TRACKING PERFORMANCE WITH SHORT-PERIOD OSCILLATORY CONTROL SYSTEM TRANSIENTS

Muckler, F. A.

January 1960

Wright Air Development Division, Aerospace Medical Lab., Wright Patterson AFB, Ohio  
WADD TR 60-3, AF 33(616)-2725

Skilled subjects performed a single-dimension compensating tracking task with apparatus incorporating oscillatory transients as control-system dynamics. The period of the transients was varied as the independent variable. System performance, as measured by time-on-target, improved as the transient period was increased from 1.0 to 35 sec. The results are felt to be highly dependent upon specific subject task control techniques. (AM, 1960, #484)

2,602. IN-FLIGHT MEASUREMENT OF THE TIME REQUIRED FOR A PILOT TO RESPOND TO AN AIRCRAFT DISTURBANCE

Kuehnel, H. A.

March 1960

National Aeronautics and Space Administration, Washington, D. C.  
TN D-22  
AD-233,589

Human-pilot reaction time in response to lateral and longitudinal aircraft disturbances has been measured in flight with a jet-powered trainer airplane. The data indicate that average reaction time is about 0.23 sec in response to lateral upsets and 0.33 sec for longitudinal upsets. These times become longer and less consistent for very small aircraft upsets or pilot stimuli and somewhat shorter for very large aircraft upsets or pilot stimuli. (ASTIA)

2,603. MANUAL ATTITUDE CONTROL IN SPACE-ARRANGEMENT OF CONTROLS

Ritchie, M. L., Hanes, L. F.

April 4, 1960

American Society of Mechanical Engineers, New York, N. Y.

Paper 60-SA-34, presented at ASME Summer Annual Meeting, Dallas, Texas, June 5-9, 1960

An experiment was run to determine the effect of arrangement of controls on the ability of human operators to stop the spin of a simulated symmetrical orbital vehi-

cle. The results indicate that it did not make a practical difference in performance whether the controls were grouped for operation by one hand, one hand and two feet, or two hands and two feet. The mean performance resulted in the use of 11.2 deg/sec of control action to stop an average vehicle spin of 10.4 deg/sec. The mean time score was 8.4 sec. The performance of the subjects in this and preceding experiments suggests that further reduction in performance scores may more readily be achieved through investigation of display techniques rather than through further studies of control arrangement. (AI/A, 1960, #2550)

**2,604. HUMAN FACTORS IN REMOTE HANDLING: SURVEY AND BIBLIOGRAPHY**

Crawford, B. M., Baker, D.

July 1960

Wright Air Development Division,  
Air Research and Development Command,  
Wright-Patterson AFB, Ohio

WADD-TR-60-476

Principal features and purposes of the main types of remote-handling systems, including sensory feedback provisions, are described. Human engineering considerations related to equipment design, motor and sensory requirements of tasks, and perceptual difficulties are discussed, and possible solutions are presented. A bibliography representing a thorough screening of information sources in the United States, Canada, Great Britain, and France is included.

**2,605. HUMAN ENGINEERING BIBLIOGRAPHY, 1958-1959**

October 1960

Tufts University, Institute for Applied Experimental Psychology, Medford, Mass.  
Report, ACR-55, Nonr-49413

AD-258,705

Personnel responsible for the human factors considerations in the design and development of equipment have a major need for rapid and easy access to the literature pertinent to their work. This bibliography, one of a planned series of annual bibliographies of literature pertinent to human engineering, is divided into five parts: (1) a topical outline which defines over 350 topic headings established for this bibliography, (2) an index which associates the approximately 1900 bibliographic entries with the topic headings, (3) an alphabetical index of the

common search terms which would aid those using this bibliography but who are unfamiliar with the topic headings, (4) an annotated bibliography of some 1900 citations, and (5) an index of the authors of these citations. 2126 references. (ASTIA)

**2,606. THE DESIGN OF OPERATOR CONTROLS: A SELECTED BIBLIOGRAPHY**

Muckler, F. A.

March 1961

Martin-Marietta Corp., Baltimore, Md.

Report on Flight Display and Flight Control Integration Program, WADD TN 60-277,

AF 33(616)7752, AF 33(616)5472

AD-267,055

A bibliographic survey of research on critical variables in the design of operator controls is presented. Major emphasis in selecting articles was placed on the problems of (1) types of manual operator controls, (2) selecting operator controls, (3) physical dimensions of operator controls, (4) inadvertent control operation and control coding, (5) environmental factors and personal equipment, and (6) layout of controls. Where pertinent, material has been added in the areas of (1) skilled operator movement characteristics, and (2) display-control relationships. Of prime interest were the physical characteristics of operator controls. 372 references. (ASTIA)

**2,607. PERSONNEL SUBSYSTEM TESTING AND EVALUATION FOR MISSILES AND SPACE SYSTEMS. AN ANNOTATED BIBLIOGRAPHY**

Gex, R. C., Compiler

April 1961

Lockheed Aircraft Corp., Sunnyvale, Calif.

SB-61-21; Report 3-36-61-1

AD-257,870

Most of the 259 references included in this bibliography contain abstracts. The emphasis is on evaluation of performance of teams of personnel engaged in operating and maintaining complex man-machine systems. Training and training equipment, personnel requirements, and human engineering studies were included if they contained information relevant to personnel evaluation. Sources checked were ASTIA technical abstract bulletins; LMSD, AFBMD, and STL reports catalogs; Air University Periodical Index; and Psychological Abstracts. (ASTIA)

2,608. MANIPULATING APPARATUS FOR THE  
REMOTE HANDLING OF OBJECTS

Hessen, V. B.

August 10, 1961

U.S. Department of Commerce, Washington, D.C.  
British Patent 874,495 (assigned to Pye, Ltd.)

A manipulating apparatus is described which has foot-operated controls for controlling lateral and backward-forward movement of the slave arm and one or more television cameras. With this apparatus, the operator can remain seated and retain his hands on the grip controls while effecting slave arm movement and/or camera control. (NSA, 1961, #26,145)

2,609. HUMAN FACTORS OF REMOTE  
HANDLING IN ADVANCED  
SYSTEMS SYMPOSIUM

September 1961

Aeronautical Systems Division, Wright-Patterson  
AFB, Ohio  
ASD TR-61-430

A compilation is given of papers presented at the Human Factors of Remote Handling in Advanced Systems Symposium, Wright-Patterson AFB, Ohio, April 18-19, 1961. Human factors in remote handling as viewed by the psychologist and the engineer are discussed. Problems of operator selection and training are presented, and manned and unmanned ground support equipment for nuclear-powered aircraft is reviewed. Space environmental constraints on extra-vehicular space operations are assessed. A representative remote-handling system for space operations is described and a three-dimensional color television system for remote handling is analyzed and evaluated. Human factors in design of remote-handling equipment are discussed.

2,610. PREDICTION-MARKER COMPUTERS AND  
DISPLAY SYSTEMS FOR CONTROLLING A  
LUNAR ROBOT VEHICLE FROM EARTH

Cohen, D.

In "IRE Eighth Annual East Coast Conference on  
Aerospace and Navigational Electronics,  
Baltimore, Md., October 23-25, 1961," p. 5.1.1  
Institute of Radio Engineers, Inc., New York, N.Y.

In controlling a lunar robot vehicle from Earth, a total delay of about 3.6 sec occurs between command and observed reaction on Earth. To assist the operator in controlling the vehicle without delay, a set of moving markers is displayed on the operation's television screen

and predicts the positions of the vehicle relative to the terrain at several instants of time. Both analog and digital computers, which can be used to calculate the marker positions, are described. (AI/A, 1962, #5512)

2,611. MAN-MACHINE DYNAMICS OF  
NOSE-WHEEL STEERING

Wohl, J. G.

*Aerospace Engineering*, v. 20, pp. 20-21, 90-94,  
October 1961

2,612. AN INVESTIGATION OF THE EFFECTS  
OF THE TIME LAG DUE TO LONG  
TRANSMISSION DISTANCES UPON  
REMOTE CONTROL, PHASE I—  
TRACKING EXPERIMENTS

Adams, J. L.

December 1961

National Aeronautics and Space Administration,  
Washington, D. C.  
TN D-1211

A series of pursuit tracking tasks were performed incorporating a transport lag in the control loop. The target was a mixture of four sine waves, the fastest having a frequency of 16 cycles per minute at full speed. An attempt was made to design the experiments so that they would provide data applicable to remote control of a ground vehicle over long transmission distances.

2,613. MAN AS A LINK IN A CONTROL LOOP

Diamantides, N. D.

*Electro-Technology*, v. 69, pp. 40-46,  
January 1962

2,614. HUMAN FACTORS AND ELECTRONIC  
COMPUTERS

Lucier, O.

*Electronic Industries*, v. 21, pp. 182-184,  
January 1962

2,615. AN INVESTIGATION OF THE EFFECTS  
OF THE TIME LAG DUE TO LONG  
TRANSMISSION DISTANCE UPON  
REMOTE CONTROL,  
PHASE II—VEHICLE EXPERIMENTS,  
PHASE III—CONCLUSIONS

Adams, J. L.

April 1962

National Aeronautics and Space Administration,  
Washington, D. C.  
NASA TN D-1351

An experimental program is undertaken to define the effects upon remote control of long transmission delays. Investigation centers around remote control of a ground vehicle, which is considered to be a representative remote control task. A series of tests with an actual vehicle are performed with the intent of relating the tracking tests to the actual situation of interest. Time delays of from 0 to 3 sec are included in the control loop. Performance is scored at various speeds over both continuous and obstacle courses. Both two- and four-wheel steering are investigated. In the experiments the effects of all variables except delay magnitude and target complexity are minimized.

2,616. HUMAN FACTORS IN TRANSMISSION MAINTENANCE  
Emling, J. W.  
*Bell Laboratories Record*, v. 40, pp. 130-136,  
April 1962

2,617. REDUCING HUMAN ERRORS BY REDESIGN OF SYSTEMS COMPONENTS  
Freitag, M.  
*Electro-Technology*, v. 69, pp. 116-118,  
April 1962

2,618. HUMAN ENGINEERING. AN ASTIA REPORT BIBLIOGRAPHY  
Silverman, M. B., Compiler  
May 15, 1962  
Armed Services Technical Information Agency,  
Arlington, Va.  
AD-274,800

This bibliography was prepared by ASTIA to make information on human engineering more readily available in document form. Citations are included for unclassified, unlimited documents cataloged by ASTIA from 1952 to the present. References are arranged alphabetically by subject area pertaining to aircraft, communication systems, control systems, display systems, data processing systems, equipment, literature, ordnance, rocket systems and guided missiles, human factors, satellites and spaceships, ships and submarines, training devices, and vehicles. 1200 references. (ASTIA)

- 2,619. HUMAN FACTORS IN ELECTRONICS — HISTORICAL SKETCH  
Birmingham, H. P.  
*IRE, Proceedings of the*, v. 50, pp. 1116-1117,  
May 1962
- 2,620. THE INTEGRATION OF MAN AND MACHINE  
Eckert, J. P., Jr.  
*IRE, Proceedings of the*, v. 50, pp. 612-613,  
May 1962
- 2,621. THE MAN-MACHINE SYSTEM CONCEPT  
McRuer, D. T., Krendel, E. S.  
*IRE, Proceedings of the*, v. 50, pp. 1117-1123,  
May 1962
- 2,622. MAN-MACHINE COUPLING, 2012 A.D.  
Page, R. M.  
*IRE, Proceedings of the*, v. 50, pp. 613-614,  
May 1962
- 2,623. DYNAMICS OF HUMAN OPERATOR CONTROL SYSTEMS USING TACTILE FEEDBACK  
Weissenberger, S., Sheridan, T. B.  
*ASME, Transactions of the, Series D—Journal of Basic Engineering*, v. 84, pp. 297-301,  
June 1962
- 2,624. INTERNATIONAL CONGRESS ON HUMAN FACTORS IN ELECTRONICS, LONG BEACH, CALIF., MAY 3-4  
*Electro-Technology*, v. 69, p. 11, June 1962
- 2,625. TIME LAG CONSIDERATION IN OPERATOR CONTROL OF LUNAR VEHICLES FROM EARTH  
Newman, R. A.  
American Rocket Society, Inc., New York, N.Y.  
Paper 2477-62, presented at the ARS Lunar Missions Meeting, Cleveland, Ohio,  
July 17-19, 1962

Before sending the first manned vehicle to the Moon, NASA plans to send a number of unmanned vehicles whose mission will be to report the conditions and features present on the lunar surface. One or more of these vehicles will probably be a remotely controlled roving lunar device. The Bendix Corporation is presently performing analytical studies to determine techniques for

performing remotely controlled missions. If a vehicle is on the Moon, the radio transmission distance and the transmission time delay involved are twenty times as great as the 130-msec delay in the example, and the effects of the delay become highly important.

2,626. HUMAN ENGINEERING

Ramsay, S. G.

*British Institution of Radio Engineers,*  
*The Journal of the*, v. 24, pp. 37-43, July 1962

2,627. CONTROL RESPONSE REQUIREMENTS

Breuhaus, W. O., Milliken, W. F., Jr.

*Aerospace Engineering*, v. 21, pp. 82-83, 124-127,  
September 1962

2,628. DESIGN IMPLICATIONS OF THE HUMAN TRANSFER FUNCTION

McRuer, D. T., Ashkenas, I. L.

*Aerospace Engineering*, v. 21, pp. 76-77, 144-147,  
September 1962

## MISCELLANEOUS AND APPENDED REFERENCES

- 2,629. AN INVESTIGATION OF GUN ANCHORING SPADES UNDER THE ACTION OF IMPACT LOADS  
Karafiath, L., Bekker, M. G.  
October 1957  
Detroit Arsenal, Center Line, Mich.  
Land Locomotion Research Branch Report 19  
AD-156,419

An investigation of conventional and novel gun spade types indicates that the "spaced link" spade offers a prospect for the radical improvement of the anchoring power of the spade. Since new guns are expected to be more powerful, yet lighter because of airportability requirements, a general method for gun spade evaluation has been proposed. This method is quite accurate in frictional soils and lends itself to limited use in cohesive soils. (ASTIA)

- 2,630. PROCEEDINGS OF THE AIR FORCE-NAVY-INDUSTRY LUBRICANTS CONFERENCE  
October 1959  
Wright Air Development Center,  
Wright-Patterson AFB, Ohio  
WADC TR-59-244, AF 33(616)-5500  
AD-231,640

This report is a compilation of papers presented at the Air Force-Navy-Industry Lubricants Conference, Dayton, Ohio, February 17-19, 1959. Thirty-four papers were presented providing a review of requirements for fluids and lubricants and of contract, industrial, and internal research and development in greases, dry friction-reducing films, engine oils, hydraulic fluids, and missile component lubrication.

- 2,631. INVESTIGATIONS OF ATMOSPHERES [LITERATURE SEARCH NO. 196]  
Hayes, J., Compiler  
March 15, 1960  
Jet Propulsion Laboratory, California Institute of Technology, Pasadena  
AI/LS 196

- 2,632. FEASIBILITY INVESTIGATION OF A PROPELLANT ACTUATED UNDERWATER ANCHOR  
March 1960  
Aircraft Armaments, Inc., Cockeysville, Md.  
Final Report ER-1966, DA 36-034-507-ORD-3126  
AD-234,685

An engineering study was conducted to establish the feasibility of imbedding an anchor into the ocean bed with a propellant actuated device. A limited testing program was conducted, and holding powers over 500 pounds were achieved. (ASTIA)

- 2,633. STRESS ASSOCIATED WITH LUNAR LANDINGS  
Rinehart, J. S.  
*British Interplanetary Society, Journal of the*, v. 17, no. 12, pp. 431-436, November-December 1960

The probable stresses which would be developed during lunar impact landings are discussed phenomenologically and quantitatively. The excursions of a 10,000-lb vehicle into rock and soil surfaces are compared. (AI/S, 1961, #30,478)

- 2,634. HYDRAULICS ON THE MOON  
Bloch, A., Konstantin, A.  
*Hydraulics and Pneumatics*, v. 13, no. 12, pp. 73-74, December 1960

The effects of size and weight, temperature, radiation, atmospheric pressure, dust, meteoric bombardment, and g-loads on hydraulic equipment for lunar use are considered. Requisites for power, reliability and standardization are discussed. (AI/S, 1961, #30,062)

- 2,635. HOW TO SELECT MAGNETIC SEPARATION EQUIPMENT  
Buss, H. W.  
*Foundry*, v. 88, no. 12, pp. 74-78, December 1960

Types of equipment used in foundry sand processing systems for the purpose of sand reclamation are described.

2,636. ACCORDION-PLEATED ASSEMBLY LINE

Lea, G. D.

*American Machinist/Metalworking Manufacturing*, v. 105, no. 3, pp. 77-79, February 6, 1961

A combination of straight-line and doubled-back assembly lines is described. The conveyor line forms a series of accordion pleats with a turntable at each fold. Advantages, including space saving, are pointed out.

2,637. SPACE STUDY WILL USE ULTRAVIOLET TELESCOPE

*Electronics*, v. 34, pp. 142-143, February 17, 1961

2,638. VLIYANIE TEMPERATURY NA SOSTOYANIE POGLOSHCHENNOI KAPILLYARNOI VLAGI V MAKROPORAKH DISPERSNOGO TELA (EFFECTS OF TEMPERATURE ON STATE OF ABSORBED CAPILLARY MOISTURE IN MACROPORES OF DISPERSION SUBSTANCE)

Kazanskii, M. F.

*Inzhenerno-Fizicheskii Zhurnal*, v. 4, no. 3, pp. 53-57, March 1961

Experiments are reported on river quartz sand and silica-gel sands of various grain dimensions.

2,639. AN EXPERIMENTAL PROGRAM TO INVESTIGATE THE SEISMOGRAPHIC NOISE LEVEL OF LUNAR CAPSULE EVAPORATIVE COOLING SYSTEMS

Reisman, E., Johnson, L., Tompkins, D.  
April 20, 1961

Ford Motor Co., Aeronutronic Div.,  
Newport Beach, Calif.  
Publication U-1230

Control of the internal temperature will be a principal problem associated with the operation of a capsule experiment on the surface of the Moon for an extended time period. During the lunar day the capsule will be receiving energy from direct solar radiation, reradiation and reflection from the lunar surface, and from internal energy generation by the contained equipment.

To provide information for the design of lunar capsule thermal control, a series of experiments was devised and carried out. The principal purposes of the experimental program were to determine the conditions under which evaporation from a free liquid surface can be maintained without boiling, and to determine the nature and magnitude of the spurious seismic signals generated by valve-

controlled and capillary-controlled evaporative cooling systems.

2,640. MECHANICAL ARMS MOVE BILLETS THROUGH BLACKLIGHT LINE

*Machine Design*, v. 33, pp. 140-141, April 27, 1961

2,641. SPACE VACUUM POSES DESIGN PROBLEMS

Jaffe, L. D.

*Nucleonics*, v. 19, no. 4, pp. 93-94, April 1961  
(Also available as TR 34-209, Jet Propulsion Laboratory, California Institute of Technology, Pasadena)

The extreme space vacuum presents two major problems to designers of space-vehicle hardware: (1) The surfaces of materials exposed to the vacuum can sublimate or evaporate, especially at high temperatures. To counteract this effect designers must choose materials with low vapor pressure. (2) Surfaces in frictional contact tend to weld together when exposed to the very low vacuums of space. These surfaces must be lubricated with a material that prevents welding, but will not itself evaporate into vacuum.

2,642. MINE LIGHTING

Roberts, A.

*Colliery Guardian*, v. 203, no. 5244, pp. 469-475, October 19, 1961

Recent developments in lighting equipment design and techniques of application are discussed. A new portable lead-acid battery has increased capacity by 20%. In it, the usual slotted tubular positive plate of ebonite or other plastic material is replaced by perforated polyvinyl chloride. Discussed also are a new twin cell battery, alkaline batteries, battery charging equipment, cap lamp safety, light output and distribution from cap lamps, and mains, fluorescent and emergency lighting. (EI, 1961)

2,643. HIGH-PRESSURE NYLON HOSE IN HYDRAULICS

*Engineering*, v. 192, p. 510, October 20, 1961

2,644. INTERNATIONAL SYMPOSIUM ON MICROCHEMICAL TECHNIQUES, AUGUST, 1961

Fennell, T. R. F.

October 1961

Royal Aircraft Establishment, Farnborough, Great Britain  
TN CHEM-1386

The proceedings of the International Symposium on Microchemical Techniques held at the Pennsylvania State University, August 13-18, 1961, are summarized. Brief notes on some of the papers read are given, and a visit to the Stamford Laboratories of the American Cyanamid Company is reported. A complete list of the papers read at the Symposium and the full text of the paper delivered by the author are appended.

- 2,645. SOIL MECHANICS, FOUNDATIONS, AND EARTH STRUCTURES DESIGN MANUAL  
November 1, 1961  
U.S. Department of the Navy, Bureau of Yards and Docks, Washington, D.C.  
NAVDOCKS DM-7

This design manual is one of a series which has been developed from an extensive re-evaluation of facilities in the Shore Establishment, from surveys of the availability of new materials and construction methods, and from selection of the best design practices of the Bureau of Yards and Docks, other Government agencies, and private industry.

- 2,646. WELDED WIRE FABRICS IN BITUMINOUS RESURFACINGS  
*Engineering*, v. 192, p. 738, December 8, 1961

- 2,647. PRELIMINARY INVESTIGATION OF LUNAR SURFACE COMMUNICATION  
Ferrara, J. P., Chomet, M.  
American Astronautical Society, Inc.,  
New York, N.Y.  
Paper presented at the AAS Lunar Flight Symposium, Denver, Colo., December 29, 1961

The results are presented of a preliminary study on the utilization of medium radio frequencies for beyond-line-of-sight transmission on the surface of the Moon. Ground-wave field intensity was calculated as a function of distance and frequency. The effects of cosmic noise, receiver parameters, and the field intensities were combined in a plot of maximum range versus frequency for a given transmitter power.

- 2,648. LUNAR TOPOGRAPHY  
Whitaker, E.  
American Astronautical Society, Inc.,  
New York, N.Y.  
Paper presented at the AAS Lunar Flight Symposium, Denver, Colo., December 29, 1961

The surface of the Moon presents a bewildering array of different topographical features, no two of which are identical in all respects. This paper does not attempt anything more than a listing of such features as briefly demonstrated and described at the meeting. Almost all types of features are included, down to a size of about one-half mile.

- 2,649. AIR IMPACT WRENCH ADAPTED TO MANY SHOP USES [ILLUSTRATIONS WITH TEXT]  
Gerber, H. J.  
*American Machinist/Metalworking Manufacturing*, v. 106, pp. 102-104, January 8, 1962
- 2,650. AIR AND THE NEWSPAPER: COMPRESSED AIR IN PRESS AND MAILING ROOMS  
*Compressed Air Magazine*, v. 67, pp. 16-17, January 1962
- 2,651. QUICK GUIDE TO PRODUCT SELECTION: SPECIFICATION CHARTS  
*Hydraulics and Pneumatics*, v. 15, pp. 105-198, January 1962
- 2,652. FLUID POWER PRODUCTS REVIEW  
*Hydraulics and Pneumatics*, v. 15, pp. 205-283, January 1962
- 2,653. POWER NAILER SMASHES NO THUMBS  
*Safety Maintenance*, v. 123, pp. 23, 26-27, January 1962
- A pneumatic hammer is described.
- 2,654. SOLVING THE TOUGH DRIVE PROBLEMS  
Metaxas, T.  
*Mill and Factory*, v. 70, pp. 92-95, February 1962
- 2,655. MUDJACKING AND UNDERSEALING RIGID PAVEMENTS  
Stackhouse, J. L.  
*Public Works*, v. 93, pp. 94-96, February 1962
- 2,656. FLUID CUSHIONING TO REPLACE GUIDE ROLLS  
*Research*, v. 15, p. 81, February 1962

- 2,657. FLUID POWER BOOK ISSUE: POWER COMPONENTS; DESIGN DATA  
*Machine Design*, v. 34, pp. 1-112,  
March 22, 1962
- 2,658. IS MAN NECESSARY? ANALYSIS AND SYNTHESIS OF A SAMPLED-DATA MODEL  
Overmyer, R. F.  
*Electrical Engineering*, v. 81, pp. 174-177,  
March 1962
- 2,659. STATIC POWER SUPPLIES FOR ADJUSTABLE-SPEED DRIVES  
Jones, R. B., Olds, A. R., Jr.  
*Electrical Engineering*, v. 81, pp. 178-186,  
March 1962
- 2,660. MINIATURE SLOW-SPEED DRIVE  
*Electro-Technology*, v. 69, pp. 126, 128  
March 1962
- 2,661. COMPRESSED NITROGEN DRIVES HIGH-ENERGY-RATE FORMING PRESS  
*Tool and Manufacturing Engineer*,  
v. 48, pp. 90-91, March 1962
- 2,662. COMPARE ELECTRICAL ADJUSTABLE SPEED DRIVES  
Marsh, R. G.  
*Plant Management and Engineering*,  
v. 24, pp. 43-46, April 1962
- 2,663. CRITICAL BIO-ENGINEERING NEEDS FOR LUNAR MISSIONS  
Rosa, J. J.  
*Aerospace Engineering*, v. 21,  
pp. 50-51, 74, 76, 78, 80, April 1962
- 2,664. PROCEEDINGS OF THE ELEVENTH LUNAR AND PLANETARY EXPLORATION COLLOQUIUM  
May 15, 1962  
North American Aviation, Inc.,  
Los Angeles, Calif.  
Volume III, No. 1

The following general topics were discussed at the Eleventh Lunar and Planetary Exploration Colloquium,

Burbank, Calif., November 28-29, 1961: planetary atmospheres, solar phenomena, the atmosphere of the Moon, and problems of lunar and planetary exploration.

Proceedings of former colloquia in this series are: Vol. I, No. 1, May 13, 1958; Vol. I, No. 2, July 15, 1958; Vol. I, No. 3, October 29, 1958; Vol. I, No. 4, January 12, 1959; Vol. I, No. 5, March 18, 1959; Vol. I, No. 6, April 25, 1959; Vol. II, No. 1, September 23-24, 1959; Vol. II No. 2, March 17, 1960; Vol. II, No. 3, November 2-3, 1960; and Vol. II, No. 4, May 23-24, 1961.

- 2,665. TELESCOPING CYLINDERS CONTROL MINUTEMAN ERECTOR  
Meddock, A. A.  
*Hydraulics and Pneumatics*, v. 15,  
pp. 118-121, May 1962
- 2,666. DRIVES AND DRIVE SYSTEMS: A SELECTIVE BIBLIOGRAPHY  
*Electro-Technology*, v. 69, pp. 90-93,  
May 1962

- 2,667. SEMI-ANNUAL PROGRESS REPORT  
June 1, 1962  
Massachusetts Institute of Technology, Mechanical Engineering Dept., Cambridge  
SA-8649-3

Most of the work during this period from October 1, 1961-March 31, 1962 has dealt with (1) the establishment of design criteria for an artificial touch system for use in remote control, and (2) the role of kinesthesia in delayed feedback control. Planned experiments testing the effects of time delay in planar manipulation tasks are described.

- 2,668. LEARNING PHENOMENA IN NETWORKS OF ADAPTIVE SWITCHING CIRCUITS  
Hoff, M. E., Jr.  
July 1962  
Stanford University, Stanford Electronics Labs., Calif.  
TR-1554-1, SEL-62-090, ASD TDR-62-767,  
AF 33(616)-7726

This report describes a practical adaptive (trainable) switching circuit, consisting of an adjustable switching circuit together with a circuit realizing an adjustment procedure. The adjustable switching circuit used has as its output a quantized linear weighted sum of the inputs;

the adjustment procedure, known as the minimum-mean-square-error method, consists of iteratively connecting the various input states to the adjustable circuit and making weight changes for each input state based on the circuit's response to that input state. Many of the properties of this system have been analyzed using an approximation, the hypersphere-area method.

**2,669. USAF CARTOGRAPHIC SUPPORT OF LUNAR MISSIONS**

Carder, R. W.

American Rocket Society, Inc., New York, N.Y.  
Paper 2474-62, presented at the ARS Lunar Missions Meeting, Cleveland, Ohio,  
July 17-19, 1962

The United States Air Force, in response to the advance of the national space program, is publishing a series of photographic and cartographic products of the Moon. A lunar atlas containing a comprehensive selection of lunar photography has been published, followed by several supplements. USAF lunar mosaics in several sizes are now available, and a series of lunar aeronautical charts, scale 1:1,000,000, sheet size 22 × 29 in. are under construction. These charts, lithographed in four colors, contain 300-m contours. This program is being accomplished jointly by the Air Force Cambridge Research Laboratory and the Aeronautical Chart and Information Center in collaboration with the scientific community.

**2,670. PENETRATION STUDIES OF SIMULATED LUNAR DUST**

Rowe, R. D., Selig, E. T.

Illinois Institute of Technology, Armour Research Foundation, Chicago  
Paper presented at Seventh Symposium on Ballistic Missile and Aerospace Technology, U.S. Air Force Academy, Colorado Springs, Colo., August 13-16, 1962, cosponsored by the U.S. Air Force and Aerospace Corporation

Results are presented for the static and dynamic penetration resistance of a simulated lunar dust in a hard vacuum environment. Specimens of finely ground silica, covering a range of densities, were tested at a number of absolute pressures from one atmosphere down to  $5 \times 10^{-8}$  torr. While the nature of their behavior was somewhat different, both static and dynamic penetration resistance were found to depend significantly on initial specimen density and on vacuum levels, increasing with an increase in density or a decrease in pressure.

**2,671. POWER SUPPLIES FOR MOBILE LUNAR VEHICLES**

Roble, R. G., Hsi H.-K., Burton, G. T.

American Rocket Society, Inc., New York, N.Y.  
Paper 2525-62, presented at the Space Power Systems Conference, Santa Monica, Calif., September 25-28, 1962

A parametric analysis was conducted on power supplies capable of providing power to two types of vehicles: (1) an unmanned vehicle for a 100-Earth-day mission, and (2) a manned vehicle for a seven-Earth-day mission. Account was taken of the hostile lunar environment and its effect on the system parameters. Suitable power supplies were selected for particular missions on the basis of the established parameters and design considerations.

**2,672. SELECTION OF POWER SYSTEMS FOR LUNAR ROVING VEHICLES**

May, J. R.

American Rocket Society, Inc., New York, N.Y.  
Paper 2523-62, presented at the Space Power Systems Conference, Santa Monica, Calif., September 25-28, 1962

Proposed accessory power systems with nuclear, solar, and chemical energy sources to provide propulsion, instrumentation, and thermal control for a lunar roving vehicle are discussed. It is shown that a completely integrated power generation thermal control and propulsion system can be provided for lunar operation. This system would include the tankage and delivery system for the cryogenic fluid, the power generation equipment, thermal control equipment, and the hydrostatic transmission for the vehicle propulsion.

**2,673. EVALUATION OF INFRARED SPECTROPHOTOMETRY FOR COMPOSITIONAL ANALYSIS OF LUNAR AND PLANETARY SOILS**

Lyon, R. J. P.

September 1962

Stanford Research Institute, Menlo Park, Calif.  
Final Report, SRI Project: PSU-3942  
NASr-49(04)

A preliminary feasibility study of infrared analytical techniques for the study of the lunar surface has been made, including absorption studies of 370 rock and mineral samples, and reflection studies of 80 rocks. Spectral

information was collected in the wavelength range 2.5 to  $25 \mu$ . Emittance spectra have been calculated from the reflectance data for several of the most important rock types.

**2,674. SURVEY OF REMOTE HANDLING  
IN SPACE**

Baker, D. F.

September 1962

Aeronautical Systems Division, Behavioral Sciences Lab., Wright-Patterson AFB, Ohio  
Final Report for October 1960–March 1961 on Human Factors in Advanced Flight,  
AMRL TDR 62-100

AD-288, 863

A survey of industrial opinion on remote handling in space was undertaken to document early concepts and to identify areas of agreement, areas of conflict, and unique ideas relating to the subject. Seven industrial concerns and one military agency provided papers on the role of remote handling in space. These papers are discussed in terms of (a) remote operations of which there are five major categories—maintenance, assembly, experimentation, transfer operations, and emergency operations; (b) space vehicle design—the manned lightweight capsule, with anthropomorphic gloves, stabilization arms, window ports, and two to three manipulator arms, being representative; (c) manipulator design—concerning actuation, configuration, control, and feedback systems; and (d) space environment factors—vision, weightlessness, temperature fluctuations, high-energy radiation, and micro-meteorite collisions. (ASTIA)

**2,675. LUNAR BASING**

DeNike, J., Zahn, S.

*Aerospace Engineering*, v. 21, no. 10, pp. 8–14,  
October 1962

A permanent lunar base is discussed in terms of location, environmental factors, base size, power supply, surface vehicles, and subsystems necessary for life support and shelter. Development problems are considered.

**2,676. MANNED LUNAR VEHICLE: DOUBLE-ACTING HYDROGEN MAY FURNISH THE FUEL**

*Machine Design*, v. 34, no. 26, pp. 14–15,  
November 8, 1962

A regenerative power system for lunar roving vehicles is described, and the advantages of this liquid-hydrogen system are discussed.

**2,677. THERMAL PROPERTIES OF A SIMULATED LUNAR MATERIAL IN AIR AND IN VACUUM**

Bennett, E. C., Wood, H. L., Jaffe, L. D., Martens, H. E.

November 25, 1962

Jet Propulsion Laboratory, California Institute of Technology, Pasadena  
TR 32-368

As part of a program designed to evaluate the properties of a powdered rock simulating the postulated lunar surface material, the effects of vacuum on the thermal diffusivity and conductivity of rock powder were measured. The thermal diffusivity and thermal conductivity for a crushed olivine basalt were determined from transient-state data. Values were obtained over a temperature range of  $-100$  to  $200^\circ\text{C}$  in vacuums of  $5 \times 10^{-3}$  and  $5 \times 10^{-6}$  mm Hg as well as at atmospheric pressure. A -150 mesh material at a density of  $1.14 \text{ g/cm}^3$  had a thermal conductivity of  $3.9 \times 10^{-6} \text{ cal/cm sec }^\circ\text{C}$  at  $100^\circ\text{C}$  when measured in a vacuum of  $5 \times 10^{-6}$  mm Hg. This was approximately one hundred times lower than the values obtained for the same material measured at atmospheric pressure. Increasing the density to  $1.57 \text{ g/cm}^3$  increased the thermal conductivity by approximately 60 percent in both air and vacuum. Over the range studied, the test temperature had very little effect on thermal conductivity in air, but showed more of an effect when the material was placed in a vacuum. (AI/A, 1963, #71,057)

**2,678. ASSEMBLY, PLACEMENT OF LUNAR SURFACE SHELTER OUTLINED IN ARS REPORTS**

Anderton, D. A.

*Aviation Week & Space Technology*, v. 77, no. 22, pp. 82–83, November 26, 1962

The following approaches to lunar shelter construction are discussed: (1) unmanned emplacement of a shelter by robot vehicles; (2) manned assembly and emplacement on the Moon; and (3) manned manufacture and emplacement.

**2,679. LAND LOCOMOTION ON THE SURFACE OF PLANETS**

Bekker, M. G.

*ARS Journal*, v. 32, no. 11, pp. 1651–1659,  
November 1962

Some principles of off-road locomotion mechanics are defined, and methods of approach are presented for the solution of locomotion problems that might exist on extra-terrestrial bodies, particularly with reference to the Moon. Equations combining the pertinent terrain and locomotive system characteristics are presented, enabling calculations to be made of various performance criteria such as thrust, motion resistance, sinkage, slope climbing ability, etc. Examples based on assumed lunar soil properties are given comparing some probable performance characteristics of tracks and wheels.

**2,680. LANDING GEAR ANALYSIS FOR LUNAR VEHICLES**

*Space/Aeronautics*, v. 38, no. 6, pt. 1, pp. 153-157, November 1962

A simple analytic method for predicting the dynamic loads on a legged vehicle during symmetric lunar landing is described.

**2,681. LUNAR SURFACE OPERATIONS SIMULATION STUDY**

November 1962  
Space-Craft, Inc., Huntsville, Ala.  
62-402

Results are presented of a study of the various characteristics of the Lunar Surface Operations Simulator. An investigation was made to solve the remote-control problems of time delay in a lunar assembly job, to use the simulator to verify commands before transmission to the Moon, and to study unforeseen difficulties which might arise during evaluation of the cited problems.

**2,682. THE ONE-WAY MANNED SPACE MISSION**

Cord, J. M., Seale, L. M.  
*Aerospace Engineering*, v. 21, no. 12, pp. 60-61, 94-102, December 1962

A scientific and technical evaluation of a one-way manned lunar mission is presented, including a summary of lunar environments, life support requirements, propulsion, vehicle design, and weights, base, and logistics requirements. The technical analysis of the mission indicates that the concept is feasible with respect to lunar missions, and that system elements are within the current state of the art.

**2,683. LUNAR TV CAMERA MANIPULATOR**

Grimm, F., Sullivan, R.  
1962

General Mills, Inc., Automatic Handling Equipment Dept., Minneapolis, Minn.  
Final Report JPL N-29999, Project 31102  
(Available through Jet Propulsion Laboratory, California Institute of Technology, Pasadena)

A three-motion lunar TV manipulator was designed and built by General Mills, Inc., to specifications of the Jet Propulsion Laboratory. Features of this manipulator which are believed to be unique are: (1) automatic temperature control; (2) compactness, efficiency, and low weight of the actuators for their torque output; and (3) means of providing lubrication. Both the general design philosophy and that pertaining to friction problems are discussed. The manipulator itself is fully described. Detailed specifications for the camera manipulator preliminary study, manipulator target, and components and procurement are given. Component and procurements specifications are included for the motor, motor winding, bearings, lubrications, actuator seal, component materials, and bearing material. Test data for the motors and actuators, and results of gear analyses are presented. Thermal analyses are described which concerned temperature control by polished metal and by insulation, TV camera temperature, and a bimetal spring control mechanism. Data gained from these analyses are given. General conclusions and recommendations for testing and evaluation are presented. Six large drawings are included.

**2,684. LUNAR VEHICLE DRIVE WITH EARTH-BOUND APPLICATIONS**

*Engineering*, v. 195, no. 5046, p. 29, January 4, 1963

An unconventional regenerative power system for a manned lunar roving vehicle is briefly described.

**2,685. LUNAR SURFACE CHARACTERISTICS**

Salisbury, J. W.  
Society of Automotive Engineers, Inc., New York, N.Y.  
Paper 632A, presented at the Automotive Engineering Congress, Detroit, Mich., January 14-18, 1963

Direct and indirect evidence for the nature of lunar surface materials is examined and compared with theoretical predictions. Conclusions are then drawn concerning the most probable character of these materials. It is concluded that the lunar surface is covered with a layer of rubble of highly variable thickness and block size. The rubble is mantled with a thin layer of highly porous dust with a complex surface and no significant coherence. Surface roughness at a meter scale remains in doubt.

**2,686. VEHICLE-SOIL MECHANICS ON  
THE MOON**

Halajian, J. D.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 632B, presented at the Automotive  
Engineering Congress, Detroit, Mich.,  
January 14-18, 1963

The changes in the ratio of surface and body forces in soils produced by the lunar vacuum and gravity are discussed, and the effects these changes will have on vehicle-soil interaction on the Moon are projected.

**2,687. REVIEW OF TECHNIQUES FOR MEASURING ROCK AND SOIL STRENGTH  
PROPERTIES AT THE SURFACE OF  
THE MOON**

Thorman, H. C.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 632C, presented at the Automotive  
Engineering Congress, Detroit, Mich.,  
January 14-18, 1963

(Also available as TR 32-374, Jet Propulsion  
Laboratory, California Institute of Technology,  
Pasadena)

Among the various instruments which have been developed for performing post-landing experiments on the lunar surface from an unmanned spacecraft are several that provide means for observing how the lunar material responds to applied stresses. These include (1) penetration-hardness gage, (2) soil-mechanics test apparatus, (3) a subsurface-sampling rock drill, and (4) a surface-sample collector. The design and operating features and the range of application of each of these four devices are reviewed.

**2,688. A LUBRICATION SYSTEM FOR SPACE  
VEHICLES**

Salmon, W. A., Apt, C. M.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 632E, presented at the Automotive  
Engineering Congress, Detroit, Mich.,  
January 14-18, 1963

The conditions of space environment, especially high vacuum, and the high degree of reliability required are two important aspects of the problem of lubrication for space vehicles. Experiments have been made using conventional designs to achieve high reliability, and a narrow gap seal with a calculated oil loss instead of a rubbing

contact seal. Two systems are evolved from theoretical considerations derived from the kinetic theory of gases. The experiments have validated the usefulness of this approach.

**2,689. THE DELIVERY SYSTEM AND  
PERFORMANCE REQUIREMENTS  
FOR A LUNAR ROVING VEHICLE**

Andrews, E. P.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 632F, presented at the Automotive  
Engineering Congress, Detroit, Mich.,  
January 14-18, 1963

A possible delivery system and the performance requirements for a lunar roving vehicle are described. The problems of off-loading, control, locomotion devices, and power sources are considered. The lunar environment (as can now be reasonably well defined) is discussed as related to the lunar rover.

**2,690. HUMAN PERFORMANCE IN THE  
ENVIRONMENT OF A LUNAR VEHICLE**

Zumbrun, S. H. N.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 632G, presented at the Automotive  
Engineering Congress, Detroit, Mich.,  
January 14-18, 1963

No major technological breakthrough is required to design an environment within a lunar surface vehicle which will support life on the surface of the Moon. Engineering aspects associated with developing a habitable environment require the coordinated efforts of engineers, psychologists, and biologists, and must accommodate the capabilities and limitations of the human operator in order to provide for environmental protection, comfort, and operating efficiency. Man, considered as a system, will function as an element of the several systems in the lunar vehicle; the lunar crew must be carefully selected and trained.

**2,691. PREDICTED BEHAVIOR OF LUNAR  
VEHICLES WITH METALASTIC WHEELS**

Markow, E. G.

Society of Automotive Engineers, Inc.,  
New York, N.Y.

Paper 632J, presented at the Automotive  
Engineering Congress, Detroit, Mich.,  
January 14-18, 1963

The behavior of a lunar roving vehicle using an elastic wheel system is investigated. This is done analytically and through the use of a  $\frac{1}{6}$ -scale model. Advantages in performance are shown for both the weak soil and the rough-textured surface model. In weak soil, the elastic wheel is shown to behave as effectively as a rigid wheel three times its size and can maintain a near-constant footprint-pressure over a 3:1 increase in load. Desirable performance in a rough-textured terrain is related to the very low unsprung weight. This has the effect of lessening the gross chassis motions, maintaining wheel contact with the surface, and significantly lowering the applied dynamic loads to the wheel and the chassis. The procedures and techniques currently accepted in the land locomotion sciences are used in all tests and analyses.

- 2,692. MECHANICS OF LOCOMOTION AND LUNAR SURFACE VEHICLE CONCEPTS**  
**Bekker, M. G.**  
Society of Automotive Engineers, Inc.,  
New York, N.Y.  
Paper 632K, presented at the Automotive Engineering Congress, Detroit, Mich., January 14-18, 1963

This paper describes methods, based on applied mechanics and simplified operational analysis, for the evaluation of various vehicle concepts considered feasible for lunar surface exploration, and shows processes through which means of locomotion may be optimized. Although little is known of the physico-geometrical properties of the lunar surface which relate to vehicle mobility, by assuming a plausible spectrum of properties, valuable preliminary information can be derived with respect to the probable effectiveness of various feasible lunar vehicle concepts. Wheeled, tracked, screw-propelled, and walking vehicles are analyzed and their probable performances compared.

- 2,693. CHARACTERIZATION OF LUNAR SURFACES AND CONCEPTS OF MANNED LUNAR ROVING VEHICLES**  
**Lawrence, L., Jr., Lett, P. W.**  
Society of Automotive Engineers, Inc.,  
New York, N.Y.  
Paper 632L, presented at the Automotive Engineering Congress, Detroit, Mich., January 14-18, 1963

The development of criteria necessary to establish reliable lunar exploration and construction vehicle concepts is discussed. To ascertain the basis for the development of these criteria, an exploration mission using the

presently conceived *Apollo* launch vehicle system is described. The criteria resulting from the study of the contribution made by the hostile lunar environment and the life support system requirements within the framework of the selected mission are established. Soil testing in a hard vacuum is described as well as tests of models under simulated lunar terrain environment. Two lunar vehicle configurations are reviewed, including design parameters and subsystem development.

- 2,694. INSTRUMENTATION FOR NUCLEAR ANALYSIS OF THE LUNAR SURFACE**  
**Monaghan, R., Youmans, A. H., Bergan, R. A., Hopkins, E. C.**  
*IEEE Transactions on Nuclear Science*, v. NS-10, no. 1, pp. 183-189, January 1963

A discussion is presented concerning the advantages of fast neutron activation, by means of a pulsed miniature neutron generator, for nuclear analysis of the lunar surface. Information can be derived from the activation gamma-ray spectrum, capture radiation, neutron moderation times, natural gamma rays, and gamma rays scattered from a gamma-ray source.

- 2,695. BIOLOGY IN SPACE [ABSTRACT]**  
**Horowitz, N. H.**  
*Aerospace Medicine*, v. 34, no. 1, pp. 71-72, January 1963  
(Abstracted from *Federation Proceedings*, v. 21, no. 4, pt. 1, pp. 687-691, July-August 1962)

Experiments currently considered for investigating the biology of Mars are discussed. Sterilization of all spacecraft landing on the Moon or planets and the possibility of back-contamination are reviewed, along with the evidence for possible life in meteorites.

- 2,696. HOW BIOASTRONAUTICS LOOKS AT THE MOON [ABSTRACT]**  
**Strughold, H.**  
*Aerospace Medicine*, v. 34, no. 2, p. 162, February 1963  
(Abstracted from *Journal of the Mississippi State Medical Association*, v. 3, no. 9, pp. 397-403, September 1962)

The problems of creating an ecological optimum for lunar visitors are discussed. Problems of vision, photosynthetic regeneration, and macro- and microclimates are also considered.

**2,697. STATUS OF DESIGNS OF LUNAR SURFACE VEHICLES**

Bliss, P. H.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," pp. 1-9

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

The activities of the various organizations that have been giving thought and design effort to producing a lunar surface traversing vehicle are summarized. This is a state-of-the-art, rather than a technical report, and is intended to survey the trends of the various designers. The different types of vehicles being proposed are discussed, and their size, type of traction, and motive power are detailed. Body styles and accessory provisions of the various vehicles are described. Where available, performance details are provided.

**2,698. HYDROPONICS OR SOILLESS CULTURE**

Chapman, H. D.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," pp. 10-15

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

The basic requirements for growing plants by the soilless culture method are given, as well as protection requirements against weather extremes, air pollution, excessive radiation, insects, and disease. Tables are presented of comparative yields of agriculture vs. hydroponics, commercial locations of soilless culture, examples of hydroponics nutrient solutions, water requirements of plants grown in open air, carbon dioxide requirements of plants for photosynthesis, light and temperature requirements of plants, and types of containers. The food requirements of man are listed.

**2,699. PROCESSING OF WATER ON THE MOON**

Fowle, A. A.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," pp. 16-18

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

After having reduced water into gaseous hydrogen and oxygen by electrolysis, the problem of reducing hydrogen and oxygen to their liquid forms for convenient storage and use is considered. The processing of water to liquid hydrogen and oxygen on the Moon to obtain systems which are lightweight, efficient, and reliable introduces some challenging technological problems.

**2,700. LUNAR BASE CONSTRUCTION**

Johnson, G. W.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," pp. 19-20

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

A concept is presented which indicates that permanently manned lunar bases are possible within this decade.

**2,701. LUNAR ROCKS AS SOURCE OF OXYGEN**

Poole, H. G.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," pp. 21-25

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

A thermodynamic study of the stability of conventional terrestrial minerals in a hypothetical lunar atmosphere has opened some interesting speculation regarding the possibility of mining oxygen from lunar rocks. Among other questions considered which have bearing on this possibility, the unanswered question of the Moon's origin appears the most important. Graphs of the thermal stabilities of several oxides are presented.

**2,702. WATER IN LUNAR MATERIALS**

Speed, R. C.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," pp. 26-32

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

Theories concerning the possible presence of water on the Moon are discussed, and a table which lists crystalline

hydrates and their water contents is presented. Methods of exploration for lunar water are considered, including spectral analysis of lunar thermal emission, ground-based geophysical surveys, neutron albedo studies, and possible qualitative indicators of hydrous rocks.

2,703. SUMMARY OF APOLLO AND LUNAR LOGISTICS SYSTEM PLANS

Taylor, W. B.

April 1, 1963

In "Utilization of Extraterrestrial Resources, Seminar Proceedings, Washington, D.C., September 25-26, 1962," p. 33

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/Seminar Proceedings

2,704. MECHANICAL AND THERMAL MEASUREMENTS ON SIMULATED LUNAR SURFACE MATERIALS

Jaffe, L. D.

Paper presented at the Lunar Surface Materials Conference, Boston, Mass., May 21-23, 1963, cosponsored by Air Force Cambridge Research Laboratories and Arthur D. Little, Inc.

2,705. TELEVISION, PHOTOGRAMMETRY, PHOTOMETRY, AND RADIOMETRY ADAPTABLE TO SPACE RECONNAISSANCE [LITERATURE SEARCH NO. 490]

Hayes, J., Compiler

1963 (to be published)

Jet Propulsion Laboratory, California Institute of Technology, Pasadena

AI/LS 490



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Hortenstine, C. C.	477	Isaac, E. J.	2,547	Johnson, P.	876	Karlson, J. H.	1,298
Horton, A. D.	886	Isaikov, V. K.	2,203	Jones, A. L.	221	Karpov, A. I.	1,428
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Hoss, R.	1,179	Isobe, T.	2,478	Jones, F. K.	1,611	Kasper, L.	1,342
Hougen, J. O.	2,489	Ito, I.	1,595	Jones, F. N.	2,525		2,270
Hounam, R. F.	617	Ivakhnenko, A. G.	2,294	Jones, F. T.	2,126		2,277
Hours, R.	844		2,295	Jones, H. C.	1,098	Kast, W.	749
Howard, G.	144		2,328	Jones, J.	1,202	Kastrop, J. E.	2,094
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	101	Iverson, G. M.	138	Jones, M. H.	2,525	Katin, K. P.	1,971
	132		160	Jones, R. B.	2,659	Katz, E. J.	697
	890	Izmailov, G. A.	828	Jones, R. S.	265		720
Howe, L. H., III	1,077			Joranson, P. N.	601	Katz, M.	856
Howe, P. W.	135	Jackson, C.	1,096		1,622	Kawasaki, K.	1,027
	1,799	Jackson, J. S.	1,539	Jordan, R. C.	636	Kaya, Y.	2,506
Howe, R. J.	2,003	Jackson, K. F.	2,559		643	Kazakevitch, V. V.	2,417
Howell, J. D.	1,238		2,592	Joseph, P. D.	2,431	Kazakov, I. E.	2,418
Hower, W. F.	546	Jackson, M. L.	429		2,463	Kazanskii, M. F.	2,638
Hozumi, K.	1,064	Jackson, P.	584	Joslin, J. G.	436	Kearney, J. L.	1,232
Hsi, H.-K.	2,671	Jackson, R. M.	450	Jouin, J.	162	Kececioglu, D.	1,562
Hubbell, C. H.	1,863	Jackson, R. P.	214		1,578	Keeler, R. N.	981
Huber, E. A.	2,395	Jacobs, M. B.	947	Joyce, D. H.	1,522	Keidel, F. A.	945
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Huff, G. A.	1,097	Jacobson, M. G.	891	Jutze, G. A.	636	Keith, L. R.	326
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	1,500	Kuszewski, J. R.	1,038	LeGrand, R.	1,195	Lindley, J. R.	1,139
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	2,000	Lachica Garrido, L. M.	561		1,131	Little, L. L.	668
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Lyons, R. T.	1,781	Marsh, R. G.	2,662	McGuire, J. G.	1,846	Milliken, W. F., Jr.	2,627
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Lyubimov, B. G.	2,073	Martin, G. S.	951	McLean, H. J.	199	Miltenberger, C. E.	1,316
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	1,168	Maskell, R. C.	1,371	McRuer, D.	2,496		2,501
MacIver, D. E.	1,958	Masuda, S.	760	McRuer, D. T.	2,621	Misra, G. B.	674
MacKay, C. F.	889		797		2,628	Mitchell, J. A.	516
Mackay, J. R.	456	Mateos, M.	486	McVey, E. S.	2,410	Mitchell, J. E.	394
MacLaurin, D. J.	601	Mathers, W. H.	456		2,458	Mitchen, J. H.	1,031
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